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Car Shop Press Work

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Managing Editor, *American Machinist*

Production limitations — Multiple punching operations on large work —Heating diaphragms in a "continuous" furnace and pressing them in a 450-ton high-speed crank-press—Two meritorious time-saving devices

UPON its press operations the railway car shop depends for production. Forming, bending, punching and shearing comprise the major machining operations for freight and passenger car parts, and the character of the machines used is, on that account, of the greatest importance.

Machine work on cars is production work, not in the sense that a machine is set-up for and run on one operation only for a long time, but rather in the sense that a machine is operated on as many as several hundred parts before the set-up is torn down. Cars are ordered in lots of from several hundred to several thousand, a point favoring production work; but frequently, in order to make deliveries without delay, and to keep completed cars moving out of the shop, it is necessary to run the parts through in small lots. For this reason, and also because of the difference in design of the cars of different roads and the long intervals of time between orders for the same road, set-ups must be as simple and as flexible as possible and the machine equipment must be adaptable for differing operations on a variety of parts. The limitations mentioned should be kept in mind in reading the following descriptions of machines and set-ups which are representative of the practice of the Pressed Steel Car Co., of McKees Rocks, Pennsylvania.

The operation of shearing a single slot for the draft rigging in center sills is shown in Fig. 3. With a similar set-up two slots are sheared in some sills at one stroke of the press. The slots are $2\frac{1}{2}$x$9\frac{1}{2}$ and $2\frac{1}{2}$x$12\frac{5}{8}$ in. Handling is the greatest item of this operation, three men being required to place the pieces on the machine and to remove them and to hook up and unhook for the crane. The machine is an A-frame, multiple punch, 122 in. between housings, made by the Covington Machine Co., Covington, Va., and driven by a 75 hp. motor.

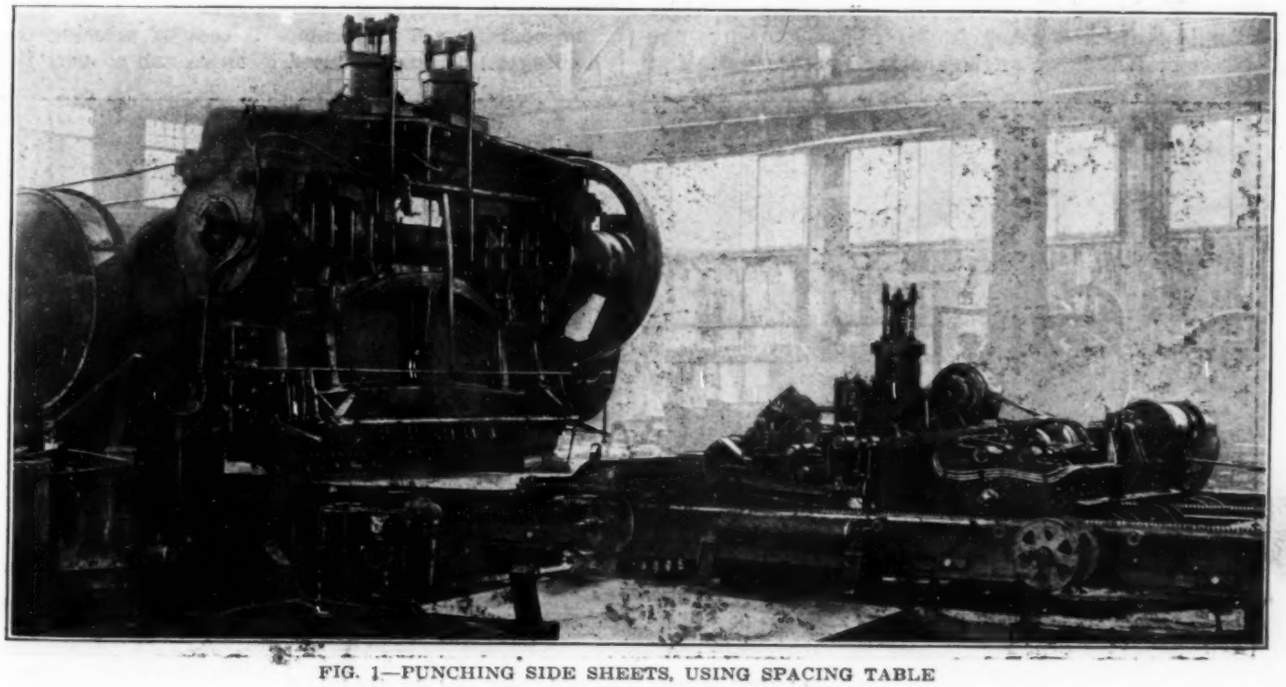


FIG. 1—PUNCHING SIDE SHEETS, USING SPACING TABLE

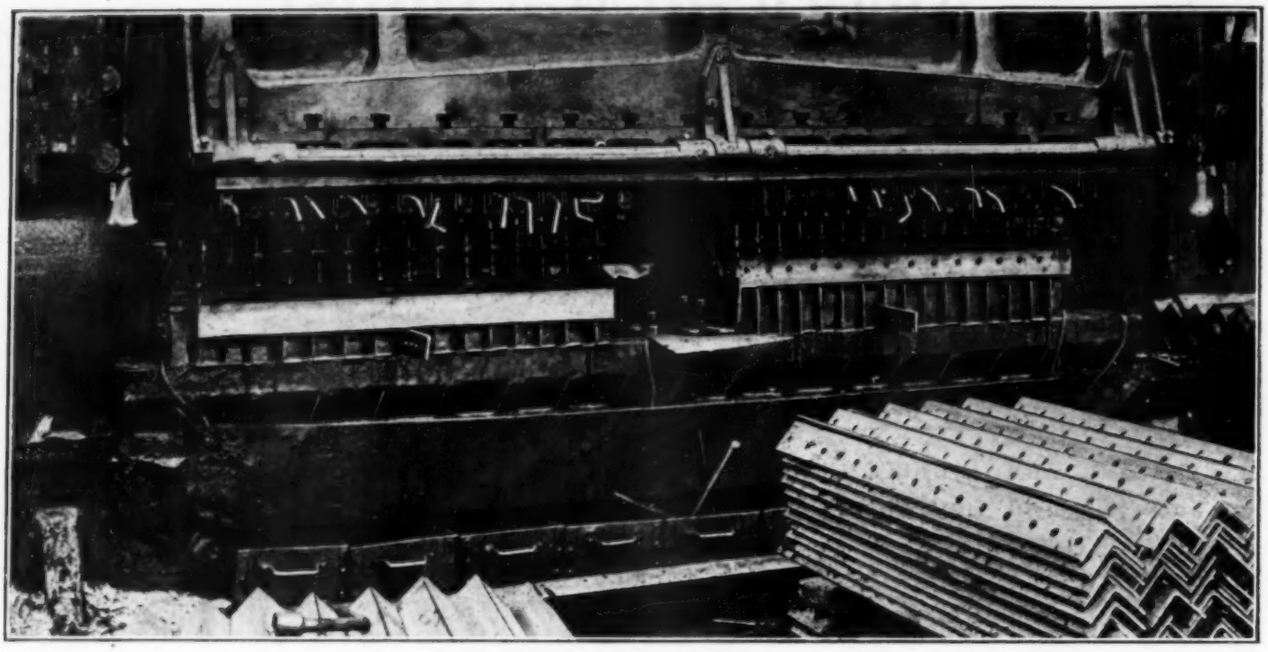


FIG. 2—PUNCHING 31 $\frac{11}{16}$-IN. HOLES IN $\frac{7}{16}$-IN. ANGLE IRON

Its capacity is 60 $\frac{11}{16}$-in. holes and one 2$\frac{1}{2}$-in. hole in $\frac{3}{4}$-in. open hearth steel. When it is used as a gang punch, the punches are placed on three levels.

Before being pressed the spring plank for the B. & O. cars, which is made of $\frac{3}{8}$-in. steel has 16 $\frac{11}{16}$-in. holes and 2 4$\frac{1}{4}$-in. holes punched in it at one stroke of the press. The machine is a multiple punch, 122 in. between housings, made by Williams, White & Co., Moline, Ill., and driven by a 30 hp. motor. The depth of throat is 30 in. and the length of stroke 6 in. The press is rated as having 600 tons pressure and has a capacity of 40 $\frac{11}{16}$-in. holes in $\frac{5}{8}$-in. open hearth steel. An oscillating stripper is used at each end of the piece, an arrangement facilitating entering and removing the work.

A multiple-punch job is shown in Fig. 2, which illustrates a machine made by the Cleveland Punch and Shear Works, of Cleveland, Ohio, punching 31 $\frac{11}{16}$-in. holes in a $\frac{7}{16}$-in. angle, 4 ft. 1 in. long, known as the bolster bottom flange angle, another B. & O. part. Two operators are required, one for each leg of the angle, the work being passed from one operator to another. The machine has a 3-in. stroke, is 120 in. between housings, punches on three levels and has a capacity of 40 $\frac{11}{16}$-in. holes in $\frac{5}{8}$-in. open hearth steel.

The same kind of a machine equipped with a Thomas spacing table is shown in Fig. 1. The operation is punching the holes in side sheets, a two-man operation. One man operates the spacing buggy, pushing it against successive stops adjusted in position along the table. The other man operates the trip and handles the gags. The front end of the side sheet is, of course, clamped to the buggy, but that method of holding, by itself, would not guide the sheet in a straight line. Consequently a follower buggy is necessary; it is clamped to the rear end of the sheet and, being itself guided on tracks, forces the sheet to travel in a straight line.

An operation of importance is that of pressing the diaphragms, or spacers, used to space and connect the

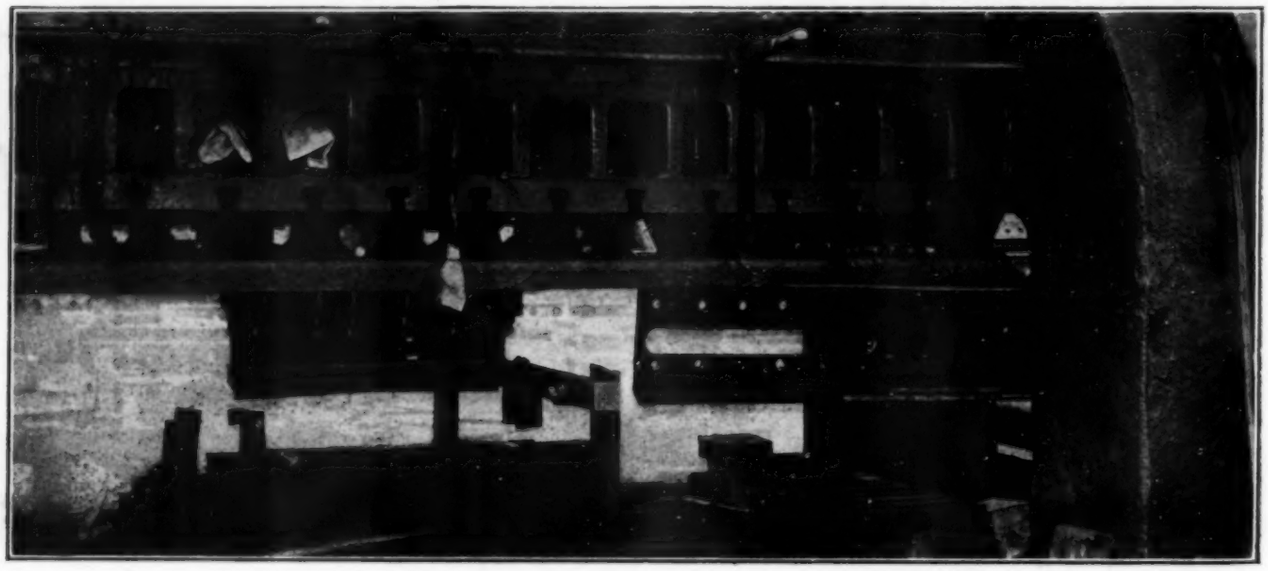


FIG. 3—SHEARING DRAFT RIGGING SLOT IN CENTER SILLS

side and center sills. There are from 6 to 18 diaphragms used on a freight car and on account of the quantity made on a large order, economy in forming them is necessary and outlay for an expensive equipment is justified. The press is one of several used by the Pressed Steel Car Co. and has a capacity of 450 tons and a very high speed.

With such great capacity the task of supplying the heated sheets to the press becomes a problem of importance, which has been solved by using a continuous plate-heating furnace. The furnace is made by Tate, Jones & Co., Inc., Pittsburgh, Pa., and is 6 ft. 6 in. wide and 30 ft. long. The work is carried through the furnace on two reciprocating beams each 12 in. wide and spaced 30 in. from center to center. The beams have a vertical lift of 4 in. and a stroke of 48 in. The conveyors are actuated by air hoists, one lifting them vertically and the other moving them horizontally. The

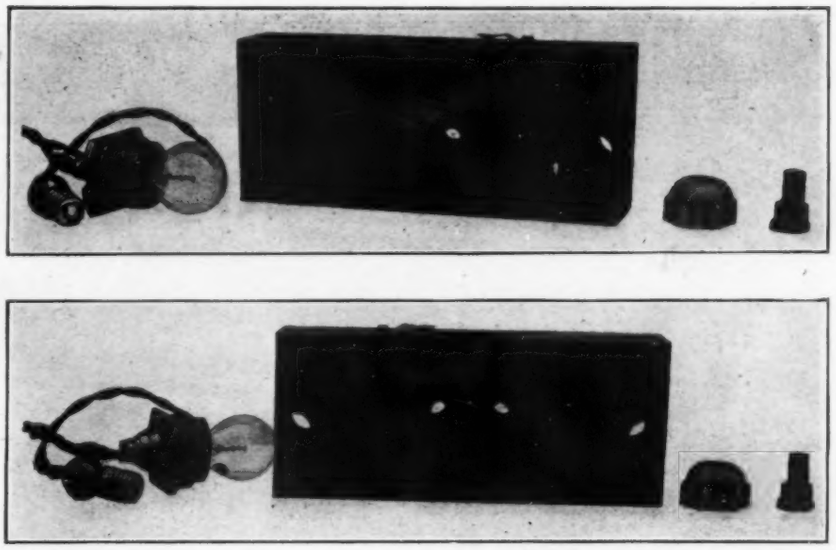


FIG. 5—PARTS OF SPOTTING ARRANGEMENT FOR LOCATING CENTER-PUNCH MARKS UNDER PUNCHES

FIG. 4—PARTS OF DIAPHRAGM PRESSING DIE

hoists are operated separately, so that work may be fed in either direction. A pit 3 ft. 6 in. wide and 6 ft. deep extends under the furnace for its entire length, to make every part accessible for adjustment and lubrication. The charging and discharging platforms are approximately 4 ft. long so that it is possible to handle an amount of metal equivalent in area to 24 sq.ft. of the hearth area at each stroke. Plates of any size from 18 in. up to 6 ft. long and up to 48 in. in width can be handled.

Firing is done by means of 14 high pressure burners. The doors are raised and lowered by means of air hoists. When working on heavy material, the furnace temperature has been run up to 2,300 deg. Fahrenheit.

Eight men are required on the operation of pressing diaphragms. One places the material on the charging platform, one operates the air hoists, two take the heated plates from the discharging platforms and place them in the die, and four carry away and pile the finished pieces.

In Fig. 4 is shown the die, which is made of cast iron and consists of holder, wearing plates, bottom, and plunger. The wearing plates are wedged into the holder and may be renewed when worn. The bottom is actuated by the crank movement of the press and pushes the pressed diaphragms from the die. No stripper is provided, as it has been found that the work rarely sticks to the plunger.

Excepting the side sheets, sills and long angles, where the spacing table is used, and for parts that are multiple-punched by a single stroke of the press, hole locations must be center-punch marked by templet. The operation is slow, but cannot be avoided. The punching operation, however, can be speeded up by employing some signal to inform the operator when the sheet is located with the punch centered over the center-punch mark. A device that is highly commendable is employed by the Pressed Steel Car Co. It has proved to be so valuable that a patent has been requested. In this device, the punch holder, as shown in Fig. 5, is arranged to hold an electric light above the punch. The punch is drilled, and the light, passing through the hole, falls directly below the center of the punch. When the plate is located so that the spot of light falls on the center-

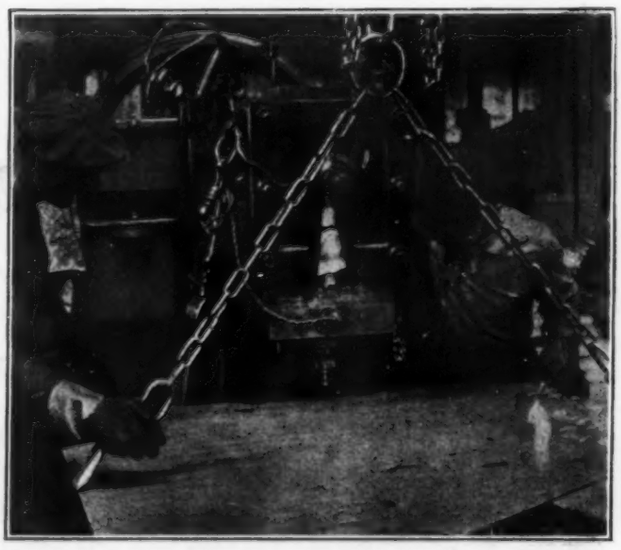


FIG. 6—SPOTTING ARRANGEMENT APPLIED TO PRESS

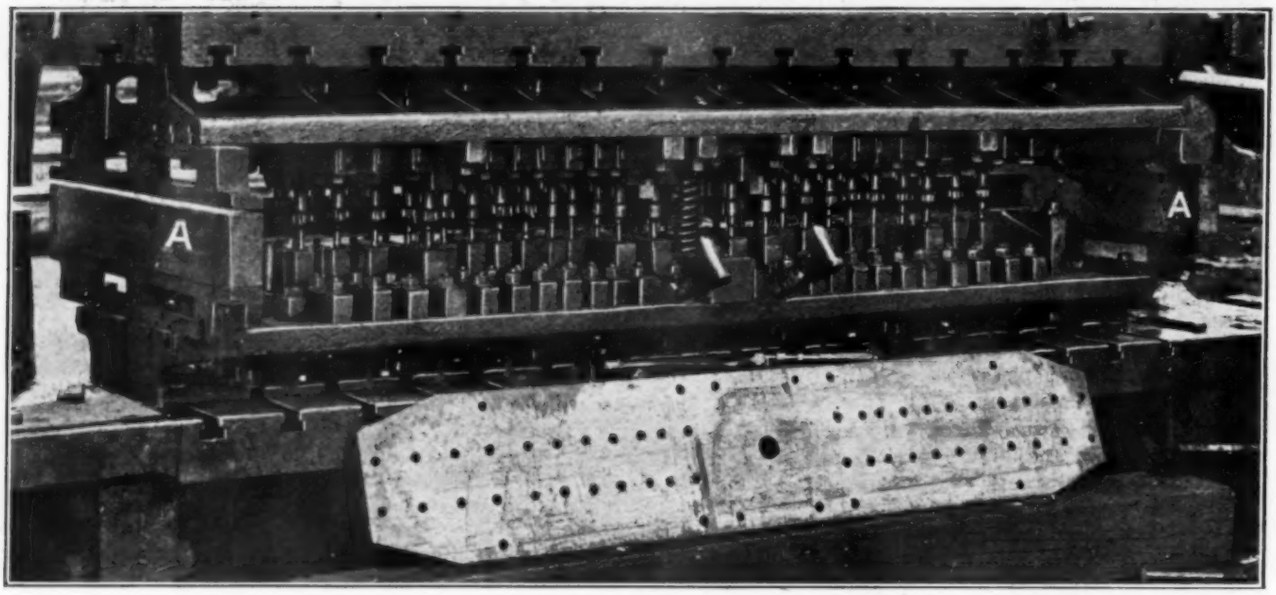


FIG. 7—PERMANENT SET-UP OF MULTIPLE PUNCHES AND DIES, WITH LOW FILLERS IN PLACE

punch hole, it is in the proper position and the press is tripped. When the first punch was arranged in this manner, it was found that the filaments of the lamp, lying horizontally, threw an oblong spot of light on the work. A corrective device consisting of a washer with an oblong hole was inserted in the punch, and no more trouble was experienced. The major axis of the hole in the washer had to be placed at right angles to the lamp filaments. In Fig. 6 a machine equipped with the spotting device is shown in operation.

Mention was made of the necessity to break up the set-ups frequently in car work. A plan to avoid dismantling some of the more difficult punch and die set-ups has been devised by the Pressed Steel Car Co., and is now being carried out. The set-up shown in Figs. 7 and 8 is used on the large press illustrated in Fig. 3 and its preservation saves not only time that would be required for dismantling and re-assembling but also the time during which the press would stand idle while the punches and dies were being adjusted and removed.

The old method was to locate the dies on the press by templet and position the punches to the dies. By the new method the dies are set up on the bolster plate by templet and blue print and the punches are located to them, much as formerly, but cast-iron fillers, *A*, Fig. 7, are placed between the upper and lower bolsters. These fillers are of such size that they would support the upper bolster at the proper height to allow the ram to just touch it, if the set-up in that condition were placed on the press, and the ram were in the lowest position. The punches are, of course, placed in the dies before the fillers and top bolster are attached. After the fillers and bolster are in place, the die holders are clamped to the bolster and the low fillers are replaced by higher ones, *B*, Fig. 8, that raise the upper bolster to such a height that when the set-up is placed on the press, the top of the bolster is $\frac{3}{8}$ in. below the bottom of the ram when in its top position, the distance of $\frac{3}{8}$ in. being allowed for clearance to facilitate placing the set-up on the press. Up to date the arrangement just described is the only one in use but it is working out so well that others will no doubt be made.

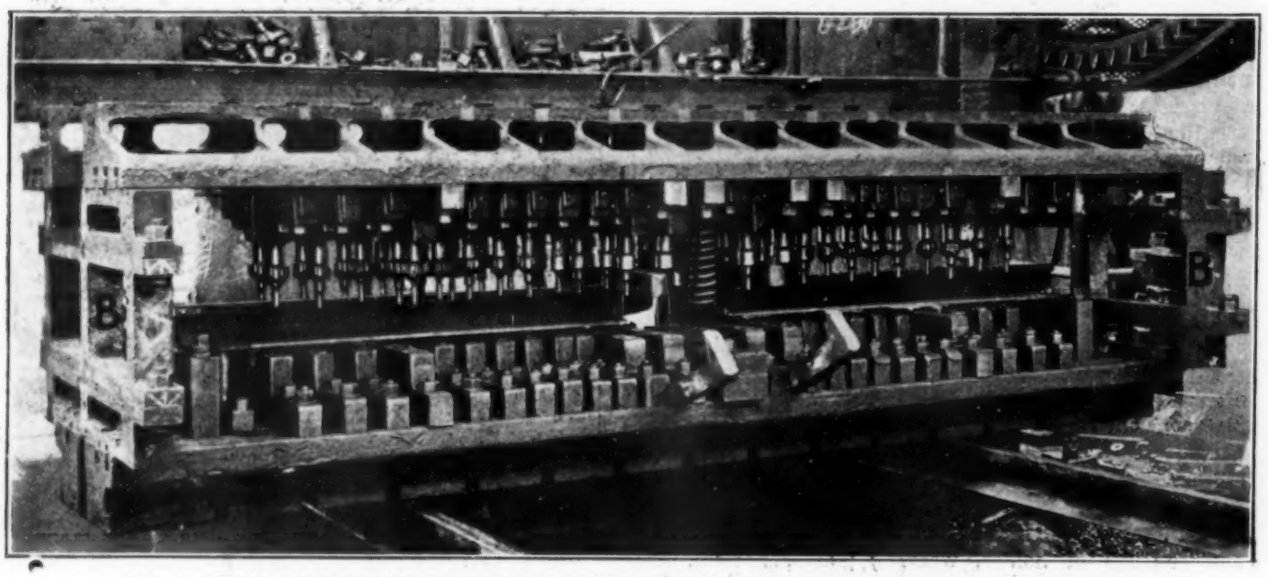


FIG. 8—PERMANENT SET-UP OF MULTIPLE PUNCHES AND DIES, WITH HIGH FILLERS IN PLACE

Special Tools for Making Paper-Mill Machinery

By E. T. SPIDY
Asst. Supt. Dominion Engineering Works

Some of the machines and methods used by the Dominion Engineering Works—Turning, boring and grinding large cylinders and rolls of various materials

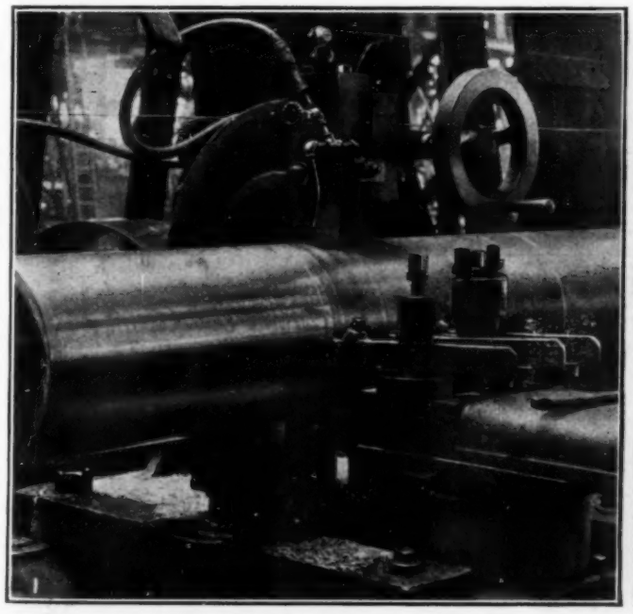
THE plant of the Dominion Engineering Works is situated at Rockfield, about seven miles from Montreal, Canada, and close to the St. Lawrence river. This plant was originally designed to build the well known Quebec bridge. On its completion and after a period of munition work, the plant was taken over by the present company, which was formed to manufacture hydraulic turbines and paper-making machines. The hydraulic machinery is made under arrangements with the I. P. Morris department of the William Cramp & Sons Ship and Engine Building Co. of Philadelphia. The paper-making machine department is taken care of by the Dominion works' own staff of designers and the success with which it has built some of the largest producing newsprint-machines testifies to its capability.

The plant consists of a main machine shop, with its sub-departments, a gray iron foundry and pattern shop. The organization includes a production department which acts as a clearing house for all information from the engineering or other departments, to the shop. This work in particular will be dealt with later and is consequently, of more than usual interest. Much of the machinery in the machine shop has been developed for the special needs of this plant. Concerning the machinery used for paper machine manufacture, there is, first of all, a large number of rolls used for various purposes. Some of these rolls are made from steel pipe, while some are heavy castings. Others are made of steel pipe with copper or brass jackets on them, while some are made of granite and have iron journals. Some are of wood, and still others are rubber covered. Occasionally more than a hundred of these rolls go into one paper-making machine, giving the opportunity for production methods and machinery.

Turning steel pipe, as anyone who has tackled the job knows, is not so easy as it looks. I refer, particularly, to pipe over 10 ft. long and from 6 in. diameter up. On the machines being built at present pipe 12, 14 and 16 in. in diameter, outside and over 20 ft. long is used.

Pipe has the knack of what the shop calls "working." If you take a cut on some pipe in the ordinary way and lay it aside for a few days, and put in back in the lathe, you are liable to think that an unsteady operator handled it the first time. This is due to the effect of breaking the skin of the pipe and releasing internal stresses in the metal.

In order to speed up this work, special tool carriages



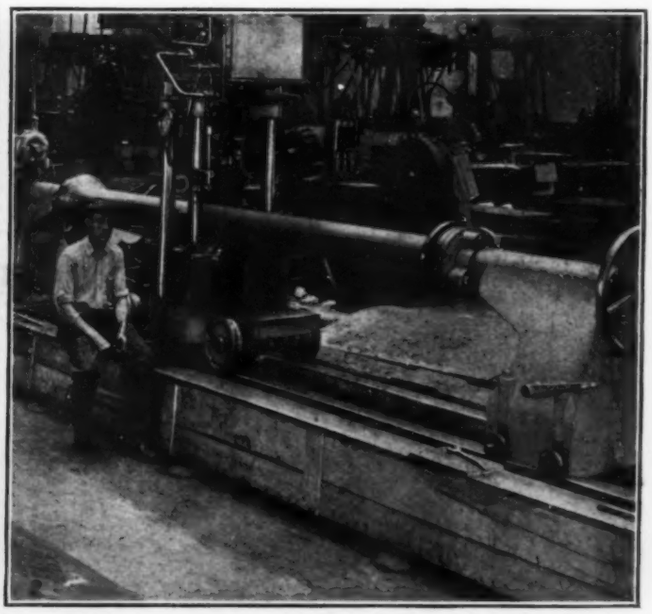


FIG. 1—SPECIAL TOOL HOLDER FOR TURNING PIPE. FIG. 2—AN EFFICIENT PIPE STRAIGHTENER

FIG. 3—DRAWING COPPER SHELL ON STEEL PIPE.

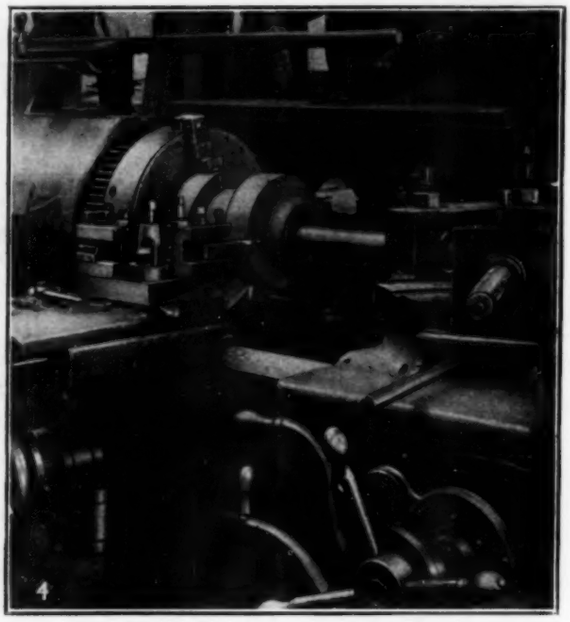


FIG. 4—TURNING ROLL HEADS ON STEINLE LATHE

have been developed and fitted to existing lathes as seen in Fig. 1. This combined tool carriage and steadyrest carries three tools in front and one in the rear, in addition to three steady blocks, two of which are shown. In many cases pipe is "good," and where the purpose for which it is to be used permits of a little extra tolerance, the whole turning operation is completed in one traverse of the carriage along the length of the pipe.

At the end of the shop where the material is received is a special machine for straightening pipe and similar work. This machine was developed by Logemann Bros., especially for this class of work and it straightens pipe in one tenth of the time required by the previous method which included a press, torch, jacks and other paraphernalia. This new machine is illustrated in Fig. 2. It should be mentioned that pipe and tubes, even when made by most advanced methods, are straight only in a relative sense. Pipe which would be "straight" for many purposes would be unsuitable for a roll that has to be turned all over. Since this is the condition confronting users of long pipe and no straighter pipe is procurable, it simply has to be straightened.

Another interesting operation is the drawing on of either brass or copper tubes over steel rolls. Some people press them on successfully but our experience has proved that thin walled copper tubing tends to buckle and loosen when pushed on. When pulled over a pipe, however, it acts in the reverse way and tends to tighten, which is what we desire. Fig. 3 shows the fixture on the planer used to draw the copper-jackets on steel pipe. The steel pipe is in front of the fixture, the thrust being taken by the block at the left. The copper pipe is behind the cross-rail.

Roll heads are usually of cast iron and are bored and reamed for the press fit on the journal in a Steinle turret lathe as shown in Fig. 4. After pressing the

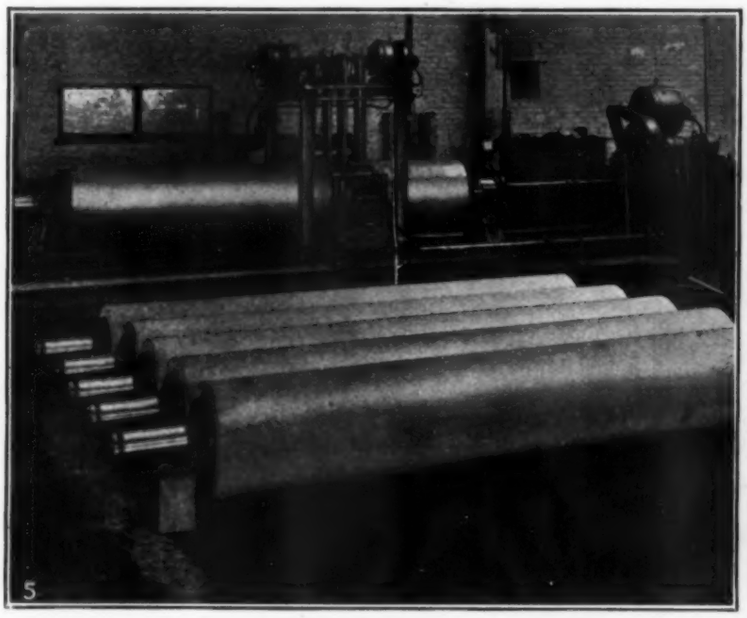


FIG. 5—GRINDING ROLLS OF GRANITE.

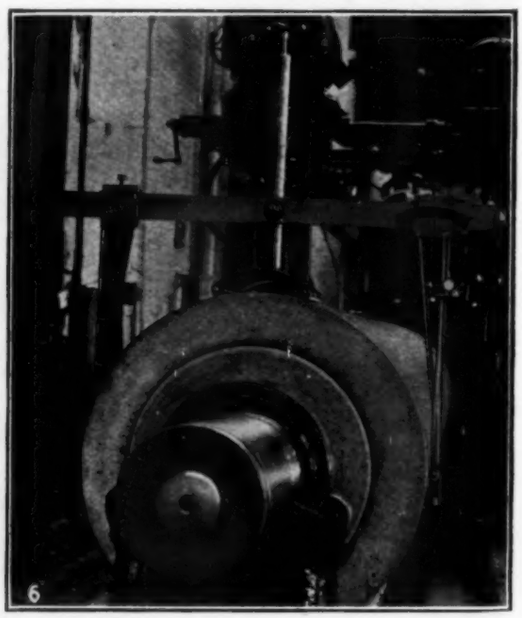


FIG. 6—CALIPERING LARGE GRANITE ROLLS

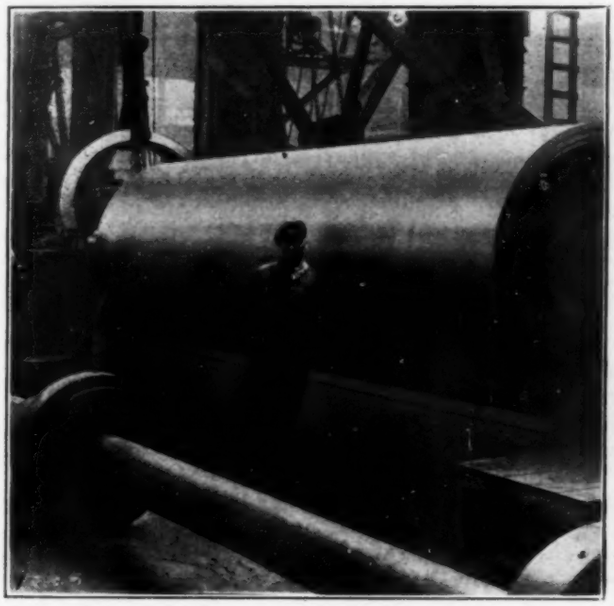


FIG. 7—BACK SIDE OF DRIER-CYLINDER LATHE.

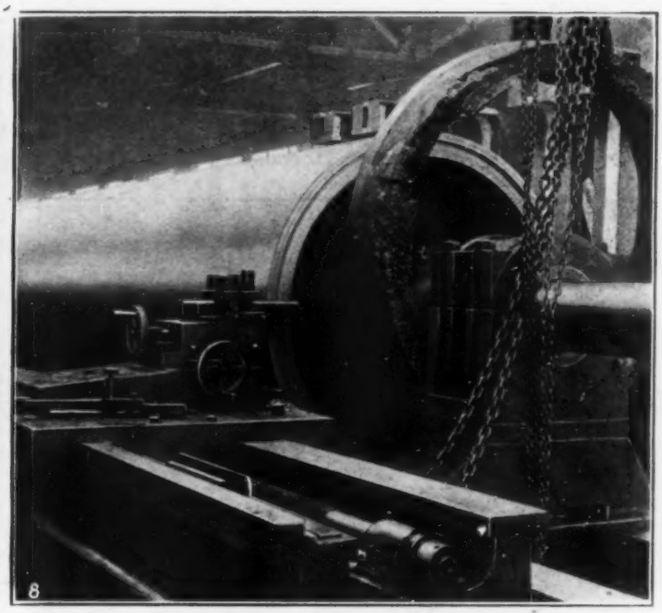


FIG. 8—FRONT OF DRIER-CYLINDER LATHE

head on the journals, the combined journal and roll head are turned on centers. The head is then turned to make a shrink or press fit into the pipe, as may be required for the particular job in hand.

Grinding rolls of all kinds is done on a special machine. The illustration, Fig. 5, shows a Farrell grinding machine finishing rolls of granite. The machine has two grinding wheels of the proper grading, one on each side of the roll, and has a profile attachment which is adjustable for crowning such rolls as require it. For the grinding operations, the rolls are run in journals instead of on centers to insure concentricity with the journals.

Fig. 6 shows a special micrometer gage for use on the grinding machine. By sliding the gage along the roll, the indicator shows variations of diameter in thousandths of an inch.

Another group of special machinery of large dimensions, is that used in the manufacture of "driers" for paper machines. Driers are cast-iron cylinders up to 72 in. in diameter and up to 230 in. long. They are turned outside and bored inside. Heads and journals are then fitted, the assembly balanced, and the cylinders finally ground on the outside, on journals, to a high finish. The driers are steam tested. In operation the paper passes over a bank of thirty to forty of these cylinders which are heated with steam to dry the paper before it is calendered and reeled.

The rough turning latches and the boring machines illustrated in Figs. 7, 8 and 9, were developed by the Dominion Engineering Works and are of extremely rugged construction. For rough turning the outside, the drier cylinders are mounted on spiders on a bar and mounted on a special bed as shown in Fig. 7. This view also shows one of the bars on which these cylinders are turned in the foreground.

Two carriages operate on the front side of the cylinder while a carriage on the back side cuts off the end of the cylinders. Extra long ends are cast on the cylinders in order to insure perfect metal at the faced

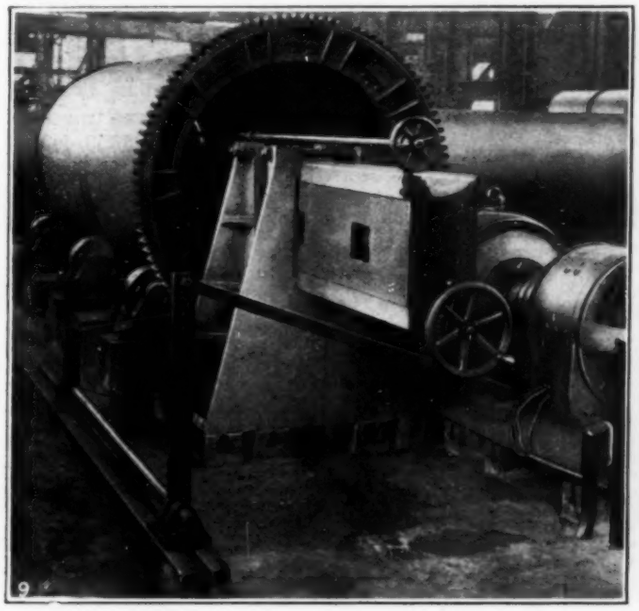


FIG. 9—SPECIAL MACHINE FOR BORING THE CYLINDER.

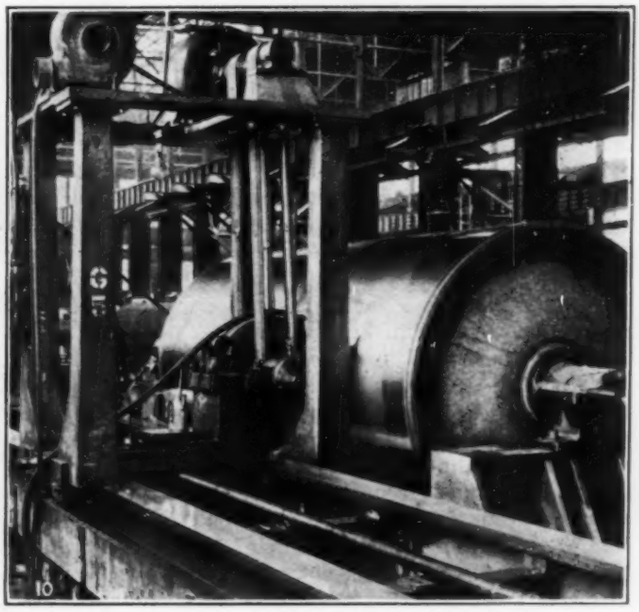


FIG. 10—GRINDING A LARGE DRIER CYLINDER

joints. The cast weight of one of these drier cylinders is around 12 tons. Fig. 8 shows the front of the lathe, the two carriages and the separate bed on which they move. The cut-off riser is shown hoisted out of the way.

The boring machine, Fig. 9, is designed to have four tools cutting at one time. It consists of a rigid bar

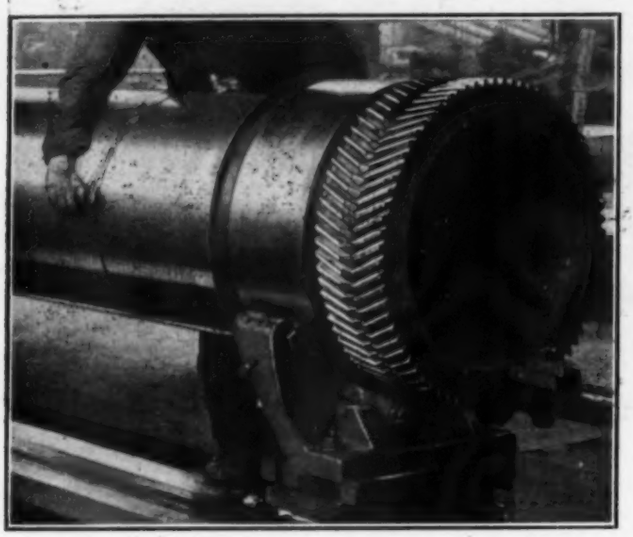


FIG. 11—MEASURING CYLINDERS WITH A TAPE

made from an old lathe bed and has a movable end support which is removed while a drier cylinder is being "threaded on," so to speak. A gear ring is bolted to the end of the drier and this gear meshes with a pinion on a Foote reduction gear box that is directly connected to the driving motor. Size is not so important in boring, as is uniformity of wall thickness, so that a uniform heat transference can take place between the cylinder surface and the paper. The weight of the drier on the rollers holds it steady against the tools which are arranged to react in a line inside the roller base area. It will be noted that the cylinder is supported by, and revolves on, rollers.

A Special Grinding Machine

Grinding the large drier cylinders is done on a special machine shown in Fig. 10, which was also built by the Dominion Engineering Works. It consists of one traversing grinding wheel with its motor, all combined with feed gear on the carriage. The driers are mounted on their journals at the proper distance away and at correct height from the grinding wheel and driven by an independent motor. It will be readily seen that the capacity of this machine is limited only by the length of travel on the bed, which is 25 ft., and the distance of the wheel center from the floor, which is 5 feet.

A brass suction roll being measured by a special tape gage is shown in Fig. 11. All cylinder diameter measurements are made by tapes, which are made in the tool room from verified standards. We find that operators quickly get used to this method and that it also prevents many errors that operators are liable to make when using calipers, because it magnifies the readings by the relation of circumference to diameter and results in more accurate work. A spring balance between the end of the tape and the operator's hand insures regular tension on the tape and is necessary for use when inspectors are checking operator's work.

Westinghouse Scholarships

FOUR scholarships, each carrying an annual payment of $500 per year, are awarded annually by the Westinghouse Electric and Manufacturing Co. to employees and sons of employees on the basis of competitive examination. Of the group completing the work last year, one graduated as a leading man in the Engineering School at the University of Pittsburgh. Two others stood high in the Engineering Division at the Carnegie Institute of Technology.

The effort of the company in selecting men for these awards has been to find young men of a many-sided nature. Intelligence, physical qualities, aptitude for engineering work, ability to shoulder responsibility and to guide their own affairs have been the general points on which the candidates are compared.

Careful consideration is given to the physical qualities of the applicant, and scholarships are awarded only to those who have the proper qualifications and adaptability. The candidate must be free from disease to be regarded as physically fit. He should also have a condition of body tending to activity. Physical vigor generally indicates mental vigor.

It is considered that general intelligence is more essential than acquired knowledge. This characteristic may be measured by one's ability to grasp quickly and accurately a new point and retain it. While different from acquired knowledge, it is generally readily measurable in terms of one's progress in such scholastic subjects as algebra, geometry and physics. These scholarships are awarded only to those who have a fundamental interest in engineering work.

Scholarship Restrictions

It is essential that the recipients of scholarships be representative individuals in the activities of whatever society they may find themselves. It is not enough merely to have a high scholarship record. Success in securing employment and in making progress in whatever line may be chosen will depend very largely on ability to mix with one's fellows, to co-operate with them in community effort, and to harmonize one's life and activities generally with the mass as a whole. For these reasons social qualities are given a large consideration in the selection. The recipients reflect credit or discredit on the donors of the scholarships according to their social prestige in school life.

It is believed that scholarships should not be awarded to those who are not willing to help themselves to a considerable extent. The annual payment of $500 is intentionally not quite large enough to cover the entire expense involved in attending a first-class engineering school. The amount is, however, sufficient to put the engineering training within the reach of certain individuals who are able and willing to add their own efforts in striving for themselves. This characteristic, so easily developed in college days, results in the initiative and resourcefulness that make those men who have put themselves through college outstanding as engineers.

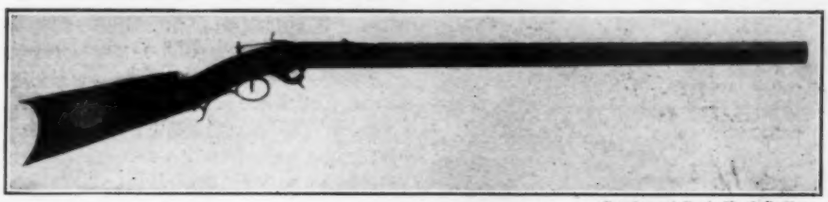
With one exception so far, the men have, after graduation, entered the employ of the company, finding their way into field work in the service department, commercial engineering, research department, design departments, etc. The single exception noted is in the case of a young man who strongly preferred construction engineering work and he was placed with an associated company specializing in this field.

Development of Machine Tools in New England

BY GUY HUBBARD

The eighth article—Richard S. Lawrence, blacksmith and inventor—The first peep sight put on a rifle—Telescope rifles made for sharpshooters in the civil war

IN 1838—about the time that the name of the Hydraulic Co. was changed to N. Kendall & Co.—there came to it by the way of Asa Story's gunshop in the West Parish, a young man of twenty-one, who had received his meager education in the "school of hard knocks" in the neighborhood of Watertown, N. Y., yet who was destined to exert a profound influence—not only upon the industries of Windsor—but upon the development of the mechanic arts in the United States and in Great Britain.



Courtesy of Capt. Hugh Smiley

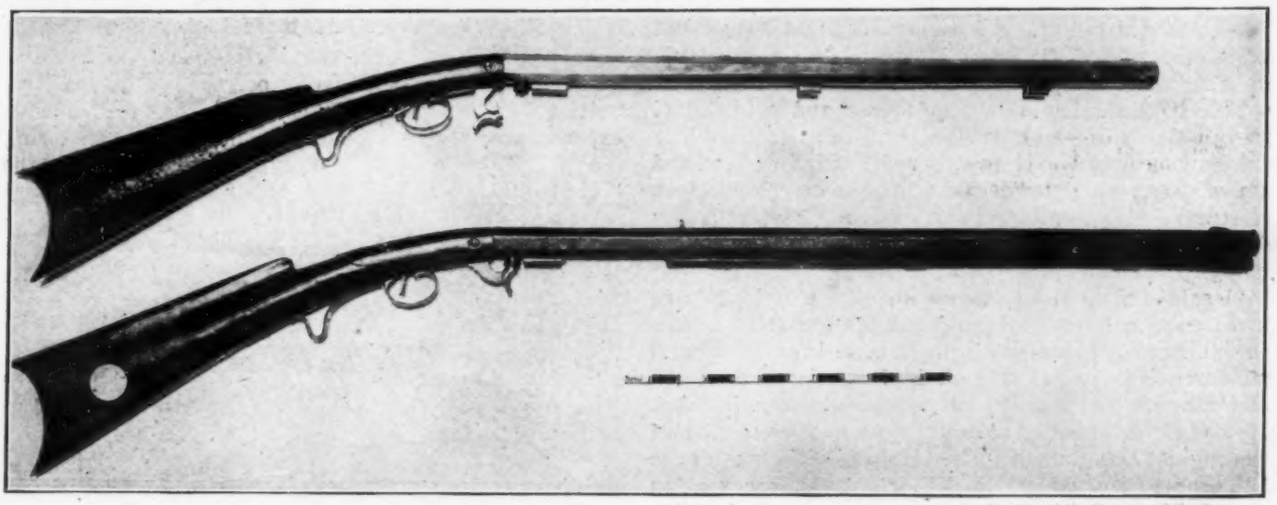
FIG. 44—HEAVY MATCH RIFLE BUILT BY N. KENDALL & CO.

The old account and time books reveal that the duties of this apprentice were many and varied, for not only did he do all kinds of gun work, but after hours he locked up the prisoners in their cells, boxed pumps and guns for shipment, cleaned out the boiler and did some of the bookkeeping.

His schooling had in all amounted to but a few months, so he practiced penmanship upon the backs of some of the sheets in the books upon which he worked. On one of these he wrote, in a flourishing copy-book style, "R. S. Lawrence, Superintendent." That this dream had something substantial behind it is indicated by the fact that in less than ten years he was at the head of a large machinery industry in Windsor, and in less than twenty years was superintendent of one of the largest industries in Hartford, Connecticut.

One of the favorite books of his apprenticeship days was Henry Howe's "Eminent American Mechanics," and this book, which is now in the possession of the writer, he must have read again and again as attested by its thumbed and worn condition. When Professor Roe, in 1916, wrote his "English and American Tool Builders," this same Richard S. Lawrence was one of the eighteen eminent American mechanics whose portraits appeared therein. It was a fortunate circumstance that his son, the late Ned Lawrence (sometime superintendent of the Pope Manufacturing Co. at Hartford) prevailed upon this pioneer mechanic in the evening of his long and useful life, to write his memoirs. To the present writer this all too modest document has served as a most fruitful and authoritative source of information. Of his debut in Windsor and of the West Parish incident leading up to it, Mr. Lawrence has given the following quaint account:

"While with Dr. Story, I found he had two rifles,



Courtesy of the Governor of the Tower

FIG. 45—TWO KENDALL RIFLES IN THE MUSEUM OF THE TOWER OF LONDON

Courtesy of Vermont Historical Society

FIG. 46—KENDALL RIFLE OWNED BY THE LATE PRESIDENT ARTHUR, AS A BOY

one of which he called his turkey rifle, made by his brother Asa Story who had a gun shop close by, and the other an old Pennsylvania rifle, full stocked, with barrel four feet long, and all rusty. This last the Doctor said had been one of the best—he had killed many a deer with it.

"I asked him to let me repair it and put a peep sight on it. He had heard of this sight but had never seen one and was very much interested, yet at first dared not let me repair the rifle for fear I would spoil it. After a while he consented to let me make the trial and went over to his brother's shop and obtained his consent to let me use his shop and tools. I then went to work, took the gun all apart, leaded out the barrel, forged out the sight, finished it, and put it on the gun. Asa Story watched me all day —he had never seen a peep sight, and a mere boy handling tools and forging out work as I did was a little astonishing to him.

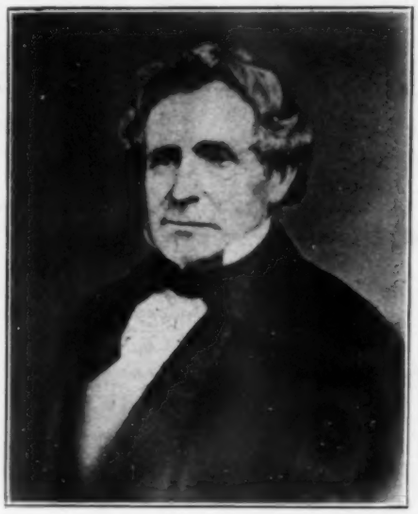


FIG. 47—DAVID H. HILLIARD

"On the Doctor's return from his daily trip, he made for the shop to see what I had done with his rifle, and he found it in such nice shape that he could not say too much in praise. He made an appointment for trial the next day as to the shooting qualities. I had most of the day to give the rifle a trial, and adjusted the sights.

"When we went out the Doctor paced off twelve rods from a maple tree, which had a three-quarter-inch auger hole in it made from a sap spile. He said, 'Fire at that.' I lay down on the ground and fired, and the Doctor tended target. He could find no ball hole, and said I had missed the tree. I fired again—no ball hole to be found!

"The Doctor then came up to me and said I had spoiled his rifle—before my repairs he could kill a chicken every time at twelve rods. I said 'Uncle, I am very sorry, but I will make the gun all right before I leave it.' He replied that he could not consent to my doing anything more to improve the shooting qualities, though the sight he liked very much.

"I said that as the gun was loaded I would take one more shot and see if I could not hit the tree. After this third shot I went up to the tree to investigate, and all three balls which I had fired were found in the auger hole. The Doctor was astonished—dumfounded. He had never heard of such shooting and we spent half the night talking about guns. He said, 'We must go to Windsor Prison where N. Kendall & Co. are making guns. They must know about the peep sight.' Mine was the first in that section.

"We went down to the prison next day and the Doctor told them all about the sight and his rifle. The company hired me at once for the term of two years at about $100 a year and board. My first work was stocking rifles. The rifles were stocked only at the breech with short stocks, and the first day I put on five stocks. Mr. Smith, one of the company, came along and looked the work over, saying: 'The work is well done but it will never do to rush work as you have, for you will soon gun stock us out of town. You must hold up a little and take it more easy.'

"After a few days I was put on iron work. As I made it a point not to let anything be done in the shop that I did not make myself familiar with, I soon found myself capable of doing the best work. The company had quite a number of free men in various branches of the work—nice parts, engraving, etc.—and I found that I was equal to any of them except on engraving. But soon after I could compete with any of them, and at the end of six months I was put in charge of the shop—much to the disgust of some of the older hands. However, I carried the work along without any trouble and to the satisfaction of all. The foreman of the shop, by the rules of the prison, acted as turnkey, so I had a portion of the prisoners to lock up. Thus I worked out my two years' engagement."

N. Kendall & Co. continued in the pump and gun business at the prison until 1842 and during that time it built underhammer arms in the form of rifles, smooth bore muskets, pocket pistols and both single- and double-barreled shotguns—fowling pieces they were called. Some of its heavy target or match rifles of about 0.45 caliber, were fitted with octagon barrels at least two inches across the flats. See Fig. 44. These massive rifles weighed nearly 20 lb. and were necessarily fired from a rest. They were frequently used at the turkey shoots which were important ceremonies at Thanksgiving time. At these turkey shoots, each

FIG. 48—TYPES OF UNDERHAMMER GUNS MADE BY HILLIARD

contestant contributed a certain amount for the privilege of shooting at a turkey tethered to a stake. Extremely long shots were required, and the rule was that if the marksman drew blood, the bird was his.

On one of these occasions, a careful marksman who wished to capture his turkey alive, succeeded in knocking off a bunch of feathers but was ruled out as no blood was drawn. Highly disgruntled, he quietly retired with his heavy telescope rifle to a clump of bushes on a distant hilltop, and those in charge were

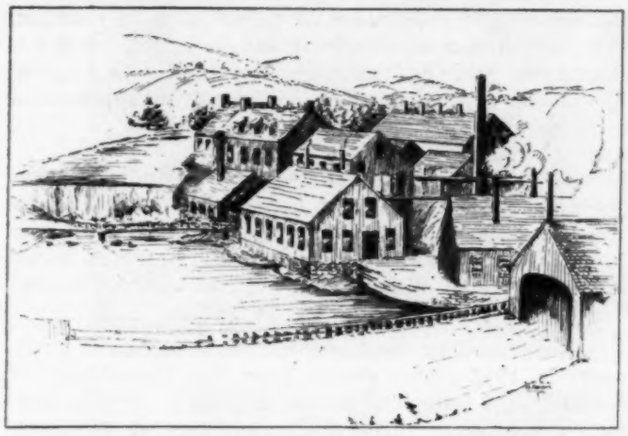


FIG. 49—SHOPS OF KENDALL & LAWRENCE
(From an old wood cut)

horrified to see the reserve turkeys in their crates drop dead one by one. Marvelous shooting was done by these rustic experts and they were the men who filled the ranks of the Union sharpshooters during the civil war.

Few Underhammer Rifles in Existence

It is a peculiar fact that of the thousands of Kendall underhammer rifles made between 1836 and 1842, but few specimens are now in existence, and that of these, two of the finest are preserved in Case 71 in the Museum of the Tower of London. These rifles were discovered not long since by a gentleman from Windsor, who happened to notice them as he was passing through the firearms division. By courtesy of the authorities of the Science Museum and of the Governor of the Tower, a photograph of these rifles is reproduced in Fig. 45. Another and older specimen is preserved in the Museum of the Vermont Historical Society. This last, shown in Fig. 46, was the hunting companion of President Chester A. Arthur during his boyhood days at Fairfield, Vt. Most of the others are in the collection of Capt. Hugh Smiley of Mohonk Lake, N. Y., who possesses the largest number of underhammer guns of any collector.

When N. Kendall & Co. reorganized, the underhammer gun business was continued by one of its skilled workmen, David H. Hilliard, in his shop across the river in Cornish, N. H. He had associated with him, William B. Smith, a former Kendall Contractor and one of the joint inventors of the waterproof rifle—to be described later as one of the earliest repeaters.

David Hall Hilliard, whose portrait is shown in Fig. 47, was born in Cornish, N H., Dec. 3, 1805, and learned the trade of blacksmith at the shop of Mr. Watrous on Mill Brook in Windsor Village. It was while working here that he built his first gun, a smooth bore, using the tools to be found in such a primitive blacksmith shop. He later went to work for the Woolson Stove Co., pioneer in the range business, at Claremont, N. H., and Ludlow, Vt., and finally learned pattern making in its branch factory at Cleveland, Ohio.

Returning to Windsor, he worked with N. Kendall for a time, and then set up his own shop at Cornish, where he built his own boring and rifling machines and, until 1877, continued to build underhammer sporting guns, which because of their high quality and low price achieved a national reputation in competition with the large makers. Although he never employed over fifteen men, they learned their trade so thoroughly under Mr. Hilliard that many of them later filled very responsible positions in the large armories of the country.

At the outbreak of the civil war, Mr. Hilliard worked day and night to build enough of his heavy telescope target rifles to arm a company of sharpshooters. When these rifles were finished he carted them to Concord and presented them to the Governor of New Hampshire, as his contribution to the cause of the Union. The rifle at the bottom of Fig. 48 is one of this type.

Hilliard's Death Universally Regretted

Mr. Hilliard was one of the most respected citizens of Cornish, and his death on June 10, 1877, was not only a blow to the townspeople but was regretted by sportsmen everywhere. To this day many of the Kendall underhammer rifles, made by Mr. Hilliard, are being used in the back country districts, and will be as long as rifle powder and percussion caps are available.

Of the reorganization of the Kendall business, Mr. Lawrence says: "During the year 1842, N. Kendall & Co. gave up the gun business, and for about a year and a half I worked for the State as foreman of the carriage shop at the prison. At the end of that time, in company with N. Kendall, I hired a shop in Windsor Village on Mill Brook and did custom gun work and jobbing." Fig. 49 is from an old wood cut of this shop.

It should be mentioned here that Kendall & Lawrence were influenced to locate in this "water shop" on Mill Brook by reason of the fact that in 1833, some of the public-spirited citizens had incorporated as the Ascutney Mill Dam Association and, at a cost of $20,000, had rebuilt and improved the three dams in Windsor Village in the hope that these more highly developed water powers would serve to promote the industrial activity of their town.

In Kendall & Lawrence this hope was to be realized, for its business was destined to rapidly expand into one of the leading armories and machinery plants of the country. It was upon this site that the principal industries of Windsor were to remain until the year 1910—nearly seventy years.

Japanese Machinery Requirements

Machinery for the re-equipment of the Japanese factories will undoubtedly be needed, and most of it will come from the United States and Great Britain, which in the past have divided Japan's machinery trade almost equally between them, states the Department of Commerce in a recent trade information bulletin. The principal industry in Yokohama was shipbuilding, and there were a number of industries at Kawasaki, midway between Yokohama and Tokio, including a phonograph factory, a cement works, an electric-bulb plant, and an iron-pipe manufacturing establishment. Most of the foreign firms importing machinery and iron and steel products had headquarters in Tokio.

Book Reviews

Kent's Mechanical Engineers' Handbook. By Robert T. Kent, Editor-in-Chief. 2247 pages, 4¼x7 in. Published by John Wiley & Sons, Inc., New York. Price, "Atholeather," $6, genuine leather, $7.

The tenth edition of "Kent," as the book is familiarly known to engineers, represents the work of the late author's son and a staff of thirty-five engineers. Following the original lines of William Kent it is a handbook for engineers and designers rather than for the men directly connected with the production of manufactured articles. The revision has brought it up to date and added much to its value.

There are 27 complete sections beginning with mathematical tables and ending with safety engineering. In between are sections dealing with materials of engineering; strength of materials, iron and steel; nonferrous metals and alloys; mechanics; heat; air; water; pumps and pumping; fuels and combustion; steam power; gas and oil power, power transmission; transportation, hoisting and conveying; machine design; function and lubrication; shop practice; refrigeration and ice making; buildings; heating and ventilation; illumination; marine engineering and electrical engineering.

A review of such a book is much like attempting to tell what is contained in an encyclopedia. And the book is too well known to need more than a notice that a new and revised edition has been published.

Strength of Materials. By Walter E. Wines, assistant professor of mechanical engineering, University of Wisconsin. First edition, clothboard covers, 6x9 in., 241 pages, 103 illustrations, 31 reference tables. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York N. Y. Price $2.25.

This book, which is classed by the publisher in the engineering education series, was prepared in the Extension Division of the University of Wisconsin, for the use of both correspondence and class students. The writer believes that the text is suited for use in other extension divisions, vocational and shop schools, and by those who without the aid of a teacher wish to review the subject or acquire a reading knowledge of it.

One of the first things that can be noted in the volume is the simple, clear and concise treatment given each subject. The arrangement and division of the subject is very good, and makes the volume suitable for reference purposes. In the front of the book are listed symbols, abbreviations and equations, while the appendix at the end is filled with tables of use for reference purposes in connection with the work.

The object of the volume is to explain the type of problems that ordinarily confront designers of machines and structures. Sample problems are worked out, and further questions and problems are submitted at the end of each chapter. The discussion is carried on with the practical utility of the subject in mind, as the application of the principles to engineering practice is brought out. In general, it may be said that the treatment is simple, rather than advanced; a knowledge of calculus is essential for only some few portions of the work. The use of many illustrations makes it easier to explain some parts of the subject. Of particular interest are the photomicrographs used to show the composition of ferrous metals.

The work is begun by treating the fundamental properties of materials and the methods of measuring those properties. After a chapter on the materials themselves, simple stresses and elastic properties are treated in turn. Thin-walled cylinders and riveted joints receive attention in the next chapter. The center of gravity and moment of inertia are then explained. Beams are given attention on points such as reaction, shear, bending moment, stress and deflection. After a chapter on columns, the subject of torsion is treated. The matter can be seen to be sufficiently comprehensive for general purposes.

Report of the Lathe Tools Research Committee, Manchester Association of Engineers. Published by His Majesty's Stationary Office, Imperial House, Kingsway, London, W.C.2. Paper covers, 89 pages, 5½x8½ in., 50 illustrations and charts, price 5s. net.

The research, of which this book contains a report, was commenced by the Manchester Association of Engineers in 1916 under grants from the Department of Scientific and Industrial Research. The work of investigation was done under the supervision of Dempster Smith in association with the Lathe Tools Research Committee, which body has prepared and is responsible for the report.

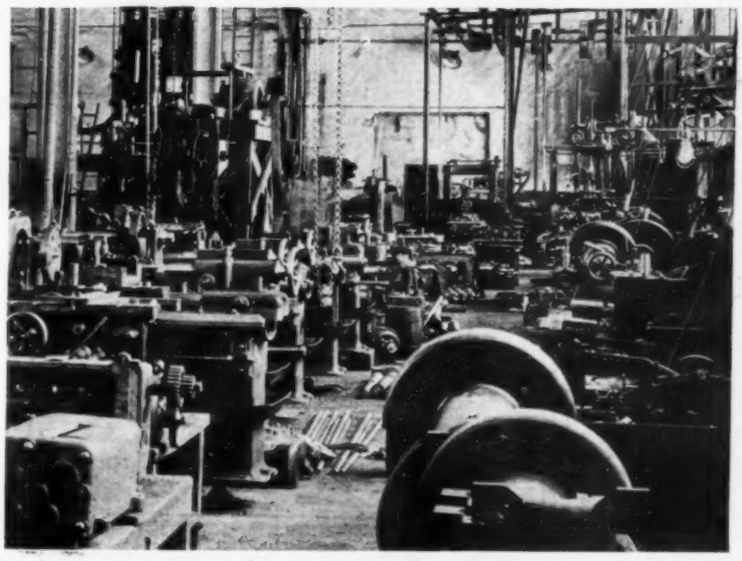
The first part of the investigation, as reported, was to obtain a heat treatment for tools which would give consistent results. Many trials were made, the results of which are tabulated and logical deductions are made.

Hardness and magnetic or electrolytic properties as a measure of the durability of a cutting tool is considered and the multitude of tests are carefully charted. The special forms of apparatus required are illustrated. It is stated that the attempt to determine the condition of tool steel by its magnetic and electrolytic properties was very unsatisfactory.

The variation in the durability of tools with change in the cutting speed, shape, cutting angle, and nose radius is shown by a great variety of tests, all of which are discussed, charted and illustrated by diagrams. The investigation of the forces acting on a tool and the power consumed in cutting concludes the report. An appendix giving practical data and charts obtained from the tests is added.

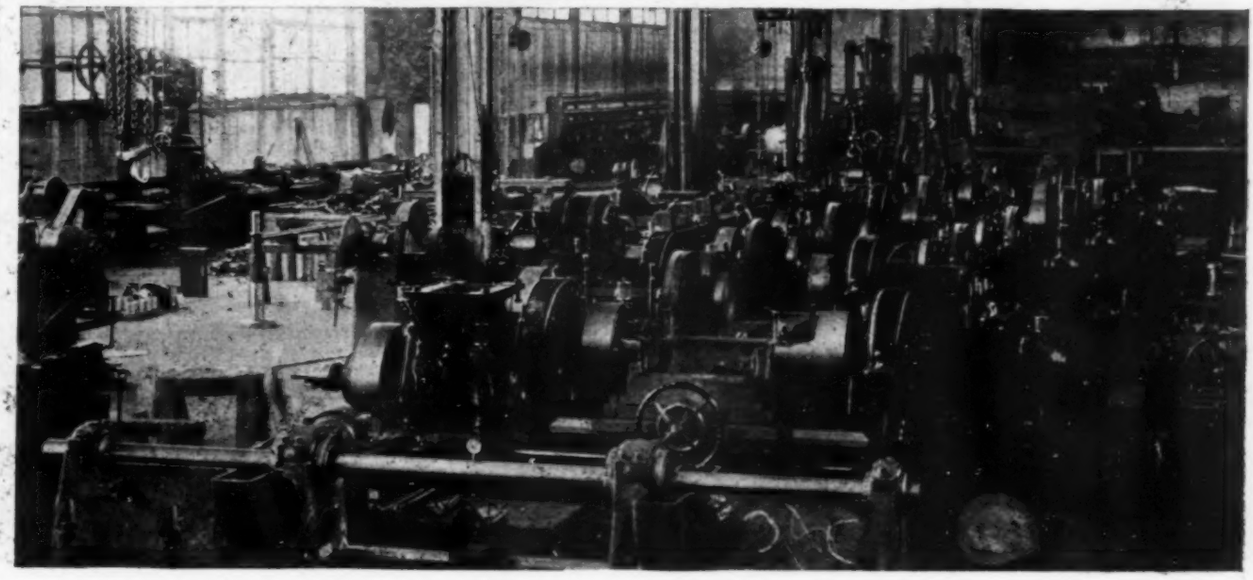
Lathe Work. By Paul N. Hasluck. Two hundred and thirty-two pages, 5x7 in. Published by D. Van Nostrand Co., New York. Price $2.

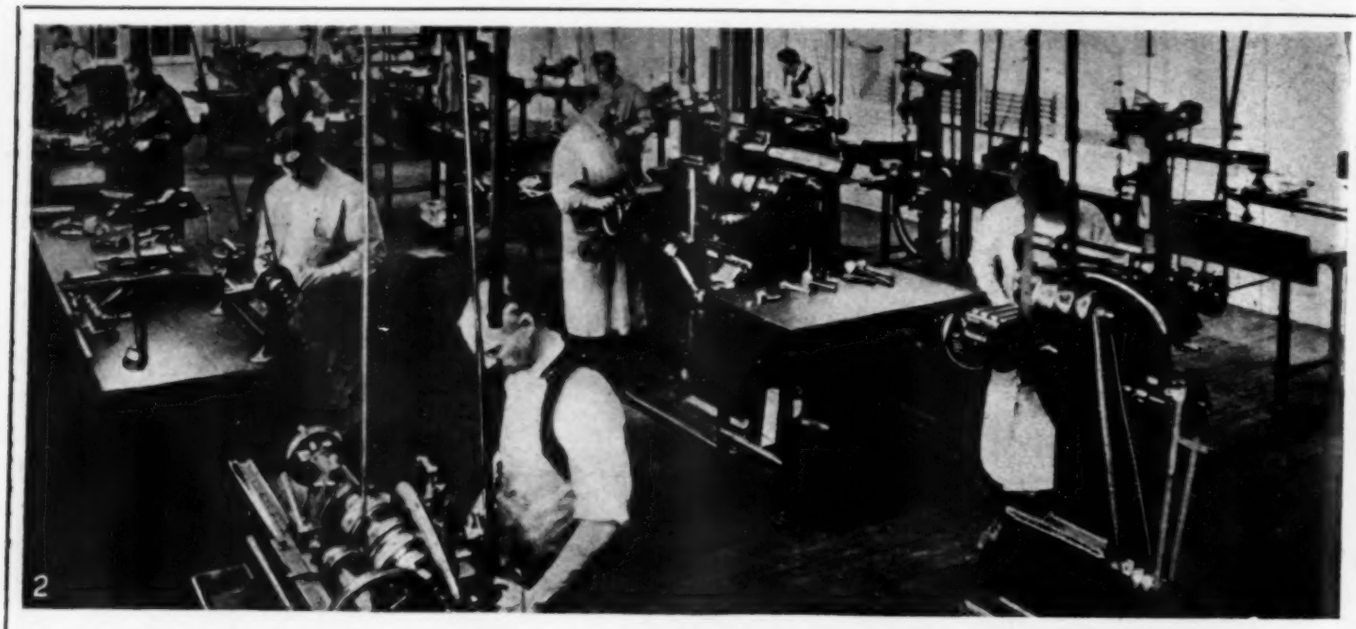
This is the eleventh edition of a book on English lathe practice which has been before the public for many years. The last two chapters, totaling 15 pages, are new and show some late forms of English capstan or turret lathes including examples of multiple tooling. The body of the book, however, remains the same as in years gone by. While it contains much information that was of value to the young mechanic of past generations, both machines and methods have changed to such an extent as to make it of little or no use in any modern shop. In view of the author's wide experience and his ability to write a modern book, it is difficult to see the reason for issuing a book of this kind with the subject matter so much out of date.

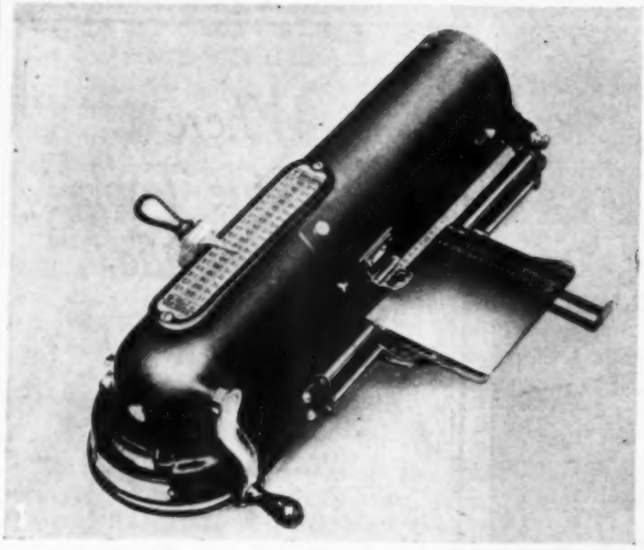


Where Machine Tools Are Made

Wickes Brothers
Saginaw, Mich.







Some Shop

On a Modern

Todd Protectograph Co.,

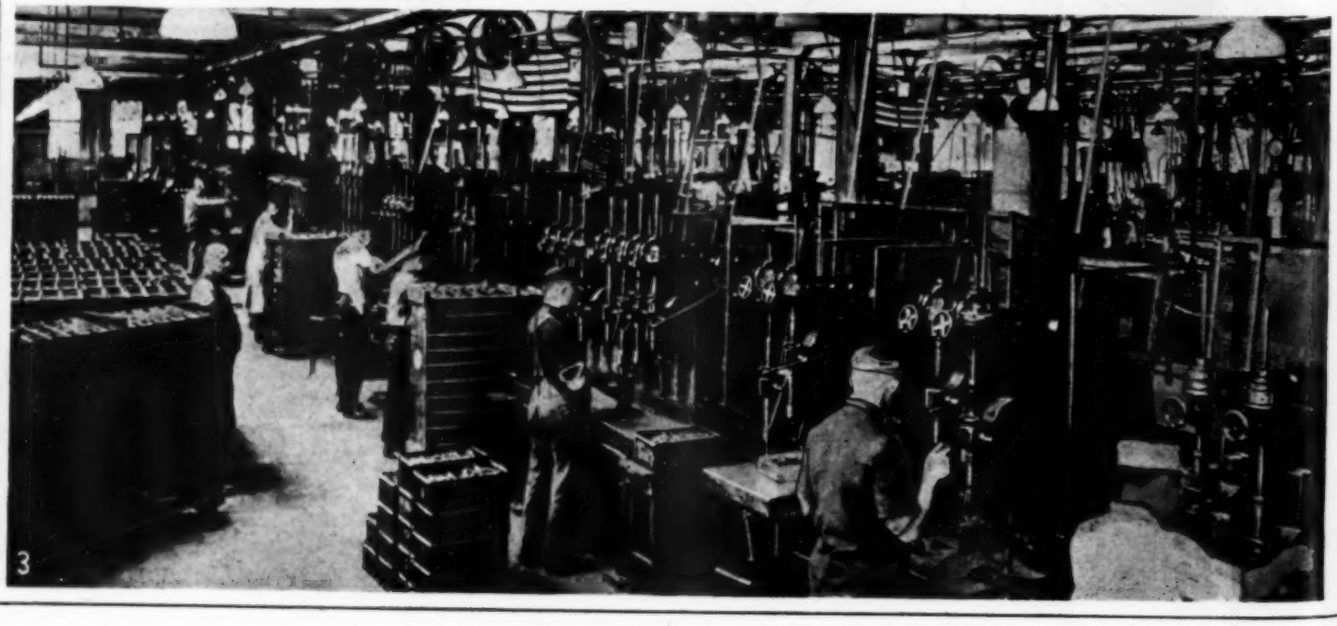
Founded

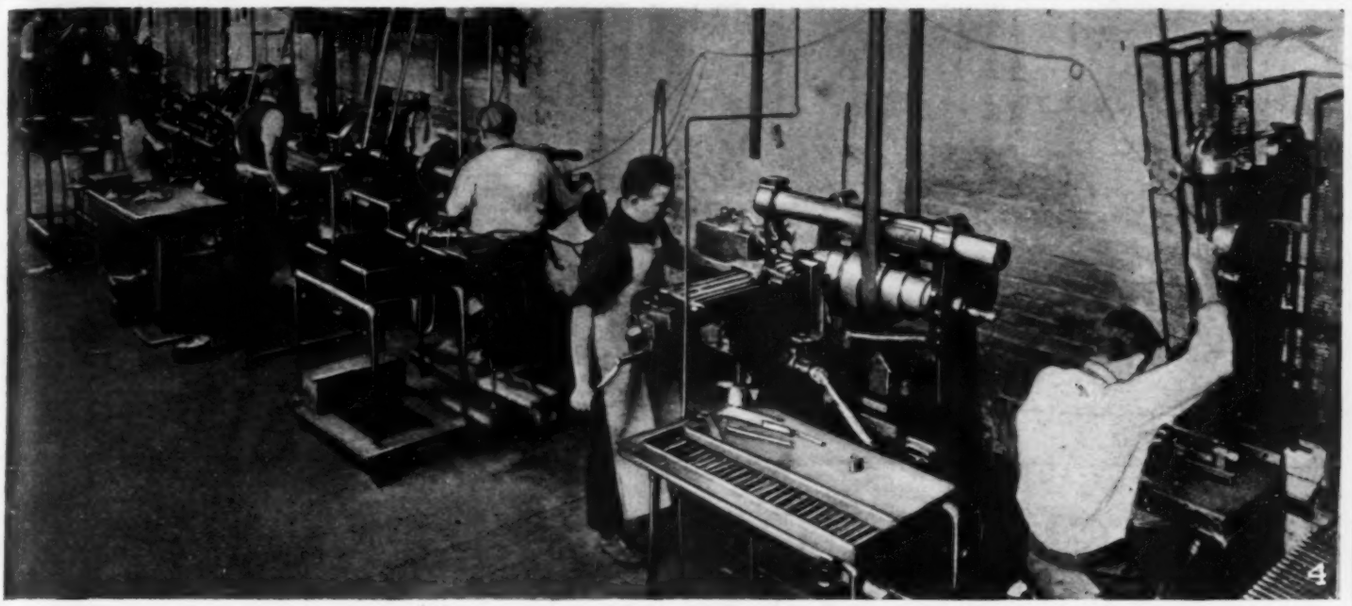
Fig. 1—The Todd Protectograph

Fig. 2—Experimental Department

Fig. 3—Drilling Department

Fig. 4—Mounting the Bronze Type





Operations

Check Protector

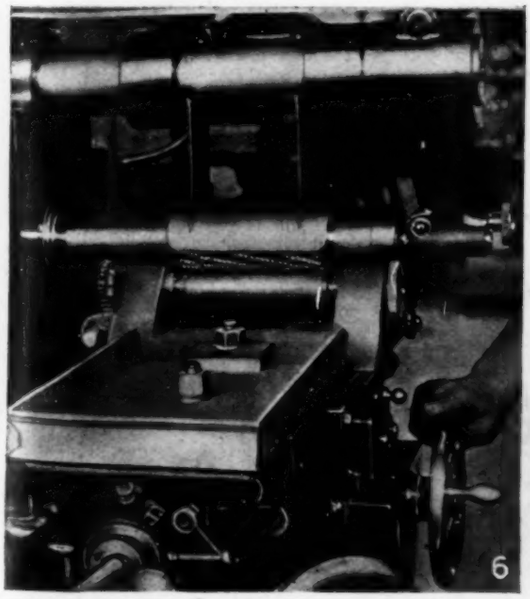
Rochester, N. Y.

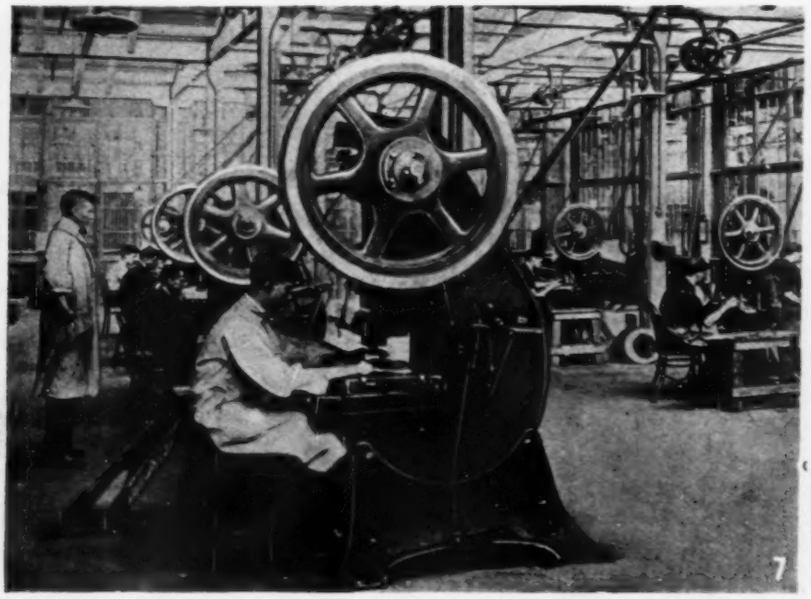
in 1899

Fig. 5—Assembly Room

Fig. 6—Cutting "Shreds" in the Type

Fig. 7—Stamping Brass, Steel and Copper Parts





NORMAN MACLEOD
Golf Champion

HOTEL GARDEN
A select spot for informal committee meetings

W. LACOSTE NEILSON
Runner-up

MACHINE TOOL BUILDERS
at Lenox

EDWARD P. WELLES
Wondering whether it went into a trap

FRED A. GEIER
Making his famous 100-yard putt

JAMES E. GLEASON
Hits one out

Championship match on the 18th tee

On the home green

Measuring the Tooth Thickness of Helical Involute Gears

BY ERNEST WILDHABER

A new method—Comparison of a measured distance with a computed standard—Ordinary vernier caliper used for measurement

HELICAL gears have always presented difficulties to accurate measurement. Their tooth thickness is usually measured with a gear tooth caliper, placed at a right angle to the direction of the tooth. Inasmuch as it is not possible to measure exactly along a normal helix, errors are introduced, which are small usually, but which cannot be easily controlled or readily determined. The determination of the chordal tooth thickness and the chordal addendum involves tedious calculation, and in addition to this, errors in the outside diameter of the gear will necessarily affect the result.

Measuring the tooth thickness of helical involute gears in the following way is simple and accurate. It does not depend on the outside diameter of the gear, and thus is not affected by its errors. No special instrument is required, for the measurement can be made with an ordinary vernier caliper.

HELICAL INVOLUTE GEAR ILLUSTRATED

A plan view of an 18-tooth gear provided with helical involute teeth, is shown in Fig. 1. The teeth are right hand and inclined at 30 deg. in the pitch circle. Fig. 2 represents a section taken at a right angle to the axis of the gear, along line *MN* of Fig. 1. The gear teeth are intersected in involutes *I*, and the curves *I'* are the involute profiles of the teeth, which appear at the gear face. These involutes correspond to a base circle *b*, shown as a continuous fine line, and the pitch circle is shown in broken lines.

The curves *I* and *I'* are true involutes, and incidentally, the intersection of a helical involute tooth with a plane perpendicular to the axis of the gear is the only plane intersection which produces a true involute as the intersection curve.

The tip edges *T* of the teeth are shown in coarse full lines in Fig. 1, while the root lines *R* are shown in finer lines, as far as they are visible. In certain teeth the root lines are hidden or partially hidden beneath the contour of the involute tooth surface itself.

An interesting characteristic of helical involute teeth is revealed by inspection of the gear. In these teeth or portions of teeth where the line of sight passes over the involute surface, the contour of the surface appears as a straight line. These straight lines are designated *S—S* on the teeth where they appear in Fig. 1. It can be proven mathematically that these lines are straight and, further, that their inclination equals the helix angle in the base circle, but the proof is long and complicated and will not be given here. As long as the actual involute surfaces are considered, all of the straight contour lines of the teeth in any one gear are parallel and equidistant.

By taking advantage of this characteristic of the helical involute tooth, the tooth thickness of helical involute gears may be determined easily and accurately by measuring the distance between the straight contours of outside tooth surfaces.

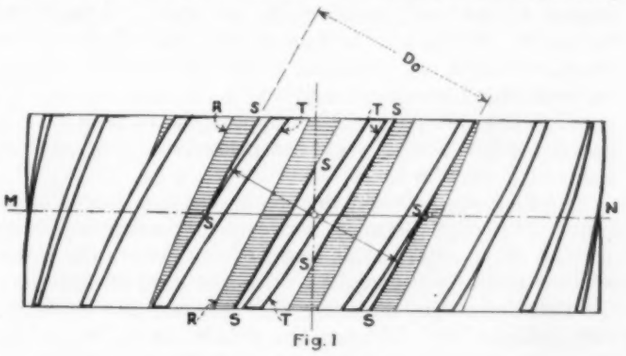


Fig. 1

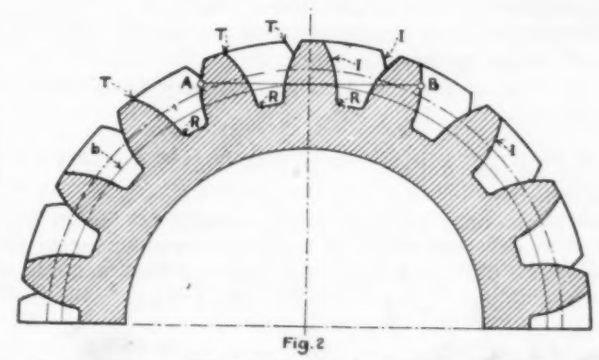


Fig. 2

FIG. 1—PLAN VIEW OF 18-TOOTH HELICAL INVOLUTE GEAR. FIG. 2—SECTION OF SAME GEAR NORMAL TO AXIS

In Fig. 1 the distance, D_o, between the outside surfaces of alternate teeth would preferably be determined, or in other words, two tooth spaces should be left between the measured tooth surfaces. With the spacing it is evident that an ordinary vernier caliper may be used to measure the distance D_o, slipping the instrument over the outside involute surfaces of the teeth and holding the line of the jaws normal to the straight contours.

The number of tooth spaces left between the meas-

ured outside surfaces is optional, but it is preferable to leave such a number of spaces in between, that the contours are measured near the pitch circle. The contact points between the teeth and the instrument should not be far away from the pitch circle. This is recommended because the area around the pitch circle is the most important part of the tooth profile, since this area is generally left unmodified, and the tips and the roots of the teeth are frequently modified, so as to recede with respect to the theoretical involute.

To meet these requirements it will be found that the number of spaces to be left depends on the number of teeth in the gear, the pressure angle and the helix angle. The required number of spaces, S, determined for a pressure angle, a', of 14½ deg. and various helix angles, h, and tooth numbers, N, are shown in the table herewith. Whenever the face of the gear is so narrow compared with its diameter, that the contact points between the instrument and the teeth are outside the face of the gear, it will be impossible to hold to the recommended S. In such exceptional cases a smaller value of S may be used.

TABLE SHOWING VALUES OF S FOR VARIOUS VALUES OF HELIX ANGLE, h, AND NUMBER OF TEETH, N. a = 14½ DEG.

Helix Angle, h	Number of Teeth in Gear, N							
10	10–24	25–36	37–48	49–60	61–72	73–84	85–96	97–108
15	10–23	24–34	35–45	46–56	57–68	69–79	80–90	91–101
20	10–21	21–31	32–42	43–52	53–63	64–73	74–83	84– 94
22½	10–20	21–30	31–40	41–50	51–60	61–70	71–80	81– 90
25	9–19	20–28	29–38	39–47	48–56	57–66	67–75	76– 85
30	8–17	18–25	26–33	34–41	42–50	51–58	59–66	67– 74
45	5–10	11–14	15–19	20–24	25–28	29–33	34–38	39– 42
S =	1	2	3	4	5	6	7	8

The distance between the tooth contours can be computed from the distance between corresponding tooth profiles in an intersection as in Fig. 2, where the intersection plane is perpendicular to the axis of the gear. To determine the distance, D_o, between the contours, the distance, AB, between the profiles is multiplied by the cosine of the straight contour inclination in Fig. 1, and as mentioned previously, this inclination equals the helix angle in the base circle.

A formula for the distance AB may be written as follows:

$$AB = \frac{\cos a'}{P \cos h}\left[(2S + 1)\frac{\pi}{2} + N\ (\tan a' - \text{arc } a')\right]$$

in which

a = Normal pressure angle, usually 14½ or 20 deg.,
a' = Pressure angle in a plane perpendicular to the axis, and in this case the pressure angle of the involute profiles in Fig. 2, $\tan a' = \frac{\tan a}{\cos h}$,
h = Helix angle in the pitch circle,
S = No. of tooth spaces from table,
N = Number of teeth in gear,
P = Diameter pitch in the normal section.

Multiplying this equation by $\cos h_o$, h_o being the helix angle in the base circle and inclination of the straight contours, the following expression for D_o is found:

$$D_o = \frac{\cos a}{P}\left[(2S + 1)\frac{\pi}{2} + N\ (\tan a' - \text{arc } a')\right]$$

To simplify the application, the following constants may be introduced for the trigonometrical terms:

$$C' = \cos a \times \frac{\pi}{2},\ C'' = \cos a\ (\tan a' - \text{arc } a')$$

$$D_o = \frac{(2S + 1)\ C' + NC''}{P}$$

The usual normal pressure angle, a, for helical involute teeth is 14½ deg. The value of C' for this pressure angle is 1.52076, and the value of C'' for various helix angles, h, are as follows:

Helix angle h	C''
10 deg.,	0.00561
15 deg.,	0.00593
20 deg.,	0.00642
22½ deg.,	0.00676
25 deg.,	0.00718
30 deg.,	0.00815
45 deg.,	0.01464

To illustrate the application of the formula for D_o, let us consider a gear in which a = 14½ deg., h = 22½ deg., P = 5, and N = 18.

From the table it is found that the number of spaces, S, is 1. The value of C' is 1.52076 and the value of C'' for a helix angle of 22½ deg. is 0.00676.

$$D_o = \frac{3 \times 1.52076 + 18 \times 0.00676}{5} = 0.9368 \text{ in.}$$

The distance, D_o, on the gear is measured over the outside straight contours of two consecutive teeth (S = 1), and a comparison of the measured distance with the computed value gives the required information regarding the tooth thickness. Should the measured distance equal 0.9368 in., the gear will have no backlash. If the measured distance is less than 0.9368 in., backlash equal to one-half the difference is indicated.

Another example of the application of the method may be of value, so let us take a gear with the same pitch and the same pressure and helix angles as the one just considered, but with 45 teeth.

In this case we find that the value of S from the table is 4, the value of C' and C'' being the same as before.

$$D_o = \frac{9 \times 1.52076 + 45 \times 0.00676}{5} = 2.7982 \text{ in.}$$

The distance between the outside straight contours, leaving four spaces, is then measured by the vernier caliper and compared with the computed value as before to determine the tooth thickness.

Polishing Crankshaft Bearings

BY CHARLES F. HENRY

Those who are not familiar with the grinding of crankshafts on a large scale, do not always appreciate the reason for polishing or buffing the crankpins and bearings after they are ground. We have become so accustomed to thinking of grinding as the last word in fine finishing that we overlook the fact that there is a vast difference in grinding, as in all other operations.

Highly skilled operators can leave bearing surfaces that require no further finish. But in large quantity production it is much cheaper to use an ordinary operator and have him produce a commercial grinding finish even though it requires another operation to make it satisfactory.

The polishing or buffing operation merely removes the fine fuzz left by the grinding wheel. If this fuzz is not removed by polishing, it acts as an abrasive and causes a wearing of the bearing surfaces which necessitates adjusting the bearings long before it should be necessary. The extra operation of polishing bearings is another of the many cases of expediency that has been developed by a careful study of all the costs of producing work of quality, in large quantities.

The New Screw Thread Standard—V

By RALPH E. FLANDERS
General Manager, Jones & Lamson Machine Co.

Discussion of the Screw Thread Report of the A.E.S.C.—Different classes of fits—Reduction of the number of threading tools required—Principles employed in specifying tolerances

TABLES II, III, IV and V, given in the previous article, completely define the new screw-thread standard for the various fits provided. The report recently given out by the Sectional Committee of the American Engineering Standards Committee, however, gives the following verbal descriptions of the fits which bring out their characteristics more plainly:

(5)—DEFINITIONS

(a)—*Loose Fit* (*Class 1*)—This class of screw threads is, in this report, recommended for use in tapped holes *in the numbered sizes only*. For such use it will be defined and specified as follows:—

Minimum Nut is Basic.

Direction of Tolerance on Nut:—The tolerance on the nut will be plus.

Tolerance Values:—The tolerance for a nut of a given pitch will be as specified in the tables.

(b)—*Free Fit* (*Class 2*)—This class of screw threads will be defined and specified as follows:—

Minimum Nut is Basic.

Maximum Screw is Basic.

Direction of Tolerance on Nut:—The tolerance on the nut will be plus.

Direction of Tolerance on Screw:—The tolerance on the screw will be minus.

Zero Allowance:—The allowance between the pitch diameter of the maximum screw and minimum nut will be zero for all pitches and all diameters.

Tolerance Values:—The tolerances for a screw or nut of a given pitch will be as specified in the tables.

(c)—*Medium Fit* (*Class 3*)—This class of screw threads will be defined and specified as follows:—

Minimum Nut is Basic.

Maximum Screw is Basic.

Direction of Tolerance on Nut:—The tolerance on the nut will be plus.

Direction of Tolerance on Screw:—The tolerance on the screw will be minus.

Zero Allowance:—The allowance between the pitch diameter of the maximum screw and the minimum nut will be zero for all pitches and all diameters.

Tolerance Values:—The tolerances for a screw or nut of a given pitch will be as specified in the tables.

(d)—*Close Fit* (*Class 4*)—This class of screw threads will be defined and specified as follows:—

Minimum Nut is Basic.

Maximum Screw is Above Basic:—The major diameter and pitch diameter of the maximum screw will be above dimensions by the amount of the negative allowance (interference) specified in the tables.

Direction of Tolerance on Nut:—The tolerance on the nut will be plus.

Direction of Tolerance on Screw:—The tolerance on the screw will be minus.

Allowance Values:—The negative allowance (interference) provided between the pitch diameter of the minimum nut, which is basic, and that of the maximum screw, which is above basic, will be as specified in the tables.

Tolerance Values:—The tolerances for a screw or nut of a given pitch will be as specified in the tables.

There is a vital difference between the two problems of maintaining standard tolerances on screws or bolts, and on nuts or other tapped holes. Screws and bolts are cut with an adjustable die or die holder, or by some other tool or process which permits the pitch diameter to be varied with ease. Holes in nuts, etc., on the contrary, are almost invariably threaded with a simple, non-adjustable tap. It is true that the pitch diameter of the finished thread in the hole can be varied by such expedients as the use of a larger or smaller supply of cutting oil, and machine tapping with a spindle out of line with the work, but these expedients can scarcely be classed as good practice.

Generally speaking, then, external threading, as of bolts and screws, is performed by adjustable tools which may be set for any desired class of fit, while holes are threaded by non-adjustable taps, which have to be made specially for the fit desired. The same general statement tends to be true for gages as well. Ring gages, projection apparatus and the like for measuring bolts and screws permit adjustment for pitch diameters of various fits. The plug gages used in tapped holes are non-adjustable.

Reduction of Number of Fits

From this it follows that the multiplication of fits and thread series, while presenting no particular difficulties so far as ring gages and dies are concerned, becomes a serious matter when we come to consider taps and plug gages. The original report called for four different fits in two thread series, or eight combinations in all. This, on the face of it, would call for the carrying in stock of eight ½-in. taps, for instance—the loose, free, medium and close fits in the coarse-thread series, and the same number of the fine-thread series. This vast multiplication of varieties of taps to be carried in stock was recognized as an economic evil of the first magnitude, for both maker and user. Two changes were therefore made in the original Progress Report to take care of this situation.

The first change consisted in cutting the number of regular fits down to three, by classing as "special" the close fit for the numbered sizes of nuts and tapped holes, and doing the same for the loose fit for the fractional sizes of nuts and tapped holes. The loose fit was also made special for all screws, bolts, studs, and the like. The reason for making a distinction between

numbered and fractional sizes is that on very small threads the tolerances for even the free fit become difficult to maintain in tap manufacture, though they are easily maintained for the fractional sizes. Again, there is not the same need for proportional accuracy in very fine threads, which usually have factors of safety immensely greater than is justified by their actual service. The same considerations lead to the setting aside of the close fit in the numbered sizes as "special."

Loose Fit Usually Undesirable

On the other hand, the Sectional Committee was very doubtful of the wisdom of standardizing the loose fit for general use in the fractional sizes of bolts, screws and nuts. There is doubtless a large volume of work of this grade being turned out today; but no manufacturer when confronted with it feels any pride swelling within his breast, and no user is really satisfied with what the manufacturer has handed him. It seems generally agreed that such work can be produced in the free-fit class without extra cost to the consumer.

This leaves us with only three fits for a given diameter and pitch. A second expedient reduces this number to two, as described below:

A Second Method of Obtaining Medium Fit (Class 3)—A detailed examination of the tolerances given in Tables II, III, IV and V will indicate that the same quality of fit as given by Medium Fit screws and threaded holes can be obtained by using screws to Close Fit tolerances in holes made to Free Fit tolerances, or vice versa. The general adoption of this practice will reduce the variety of taps, gages, threaded parts, etc., required to be carried in stock. However, the combination of Free and Close Fits should be used in place of Medium Fits only when the substitution is understood and agreed to by all parties concerned.

By the means just outlined the number of taps and plug gages for a given diameter and pitch is reduced to two, and it is hoped that this will be the result of the revision of the report.

In the case of taps, this arrangement will mean a commercial grade, of practically the tolerances now furnished by the best makers, to cover the loose fit numbered sizes and the free fit fractional sizes; and there will be, in addition, a precision grade, made in the numbered sizes perhaps by rolling the threads and in the fractional sizes by grinding. There is already a large business in ground taps, and its volume is constantly increasing.

It will be seen, therefore, that the report calls for no radical changes in tap manufacture, only a continued growth along lines already laid down.

The report gives the following general observations on the subject of tolerances:

V—TOLERANCES

1—*Tolerances Represent Extreme Variations*—The tolerances as hereinafter specified are for the classes of fit listed in the body of the report, and represent the extreme variations allowed on the work. (See Appendix A, Section 2.)

2—*Pitch Diameter Tolerances.*—These are derived from the pitch of the thread instead of from the diameter. The method of derivation is explained in Appendix A.

3—*Pitch Diameter Tolerances Include Lead and Angle Variations*—The relations between these quantities are expressed by lines 33 to 40, inclusive, of the tables, and are explained at the bottom of each table. See also Appendix B.

These relations may be automatically insured by using a "Go" gage of the length of engagement required, or by projecting an equivalent length of thread on a suitable chart, or by so projecting a single thread constrained for the required length of engagement, or by any other means which preserves the mathematical relation between variations in pitch diameter, lead and form.

The relations between pitch diameter, lead and thread angle are very important, and will be discussed in a separate chapter.

4—*Fitch Diameter Tolerances on Screw Same as on Nut*—The pitch diameter tolerances provided for a screw of a given class of fit will be the same as the pitch diameter tolerances provided for the corresponding nut of the same class of fit.

5—*Tolerances on Major Diameter of Screw Twice Pitch Diameter Tolerances for Free Fit*—The allowable tolerances on the major diameter of screws of all classifications will be twice the tolerance value allowed on the pitch diameters of screws of the Free Fit (Class 2).

6—*Tolerances on Minor Diameter of Screw*—The minimum minor diameter of a screw of a given pitch will be such as to result in a basic flat ($\frac{1}{8} \times p$) at the root.

The maximum minor diameter is that which would result from the use of a threading tool, set at the maximum pitch diameter, whose point has been worn or ground back from the basic outline by an amount equal to one-eighteenth of the basic depth of engagement ($1/18h$ or $0.03684p$). It is permissible that the resulting root line shall be rounded. In no case, however, should the form be such as to cause the screw to be rejected on the minor diameter by a "Go" gage, the minor diameter of which is equal to the minimum minor diameter of the nut.

7—*Tolerances on Major Diameter of Nut*—The maximum major diameter of the nut of a given pitch will be such as to result in a flat one-third of the basic flat ($\frac{1}{4} \times p$).

The nominal minimum major diameter of the nut equals the basic major diameter. In practice a clearance is provided to facilitate manufacture by permitting a slight rounding or wear at the crest of the tap. In no case, however, should the outline resulting from a worn tap or cutting tool be such as to cause the nut to be rejected on the major diameter by a "Go" plug gage made to basic form and dimensions at the crest.

It will be noted that neither the minimum minor diameter of the screw nor the maximum major diameter of the nut are given directly. These dimensions are limited by the smallest permissible flat allowed ($\frac{1}{8} \times p$ for the screw and $\frac{1}{4} \times p$ for the nut) in combination with the minimum pitch diameter given for the screw and the maximum given for the nut.

Some Dimensions Measured Indirectly

The reason for this is almost self-evident. The minor diameter of the screw and the major diameter of the nut are seldom measured directly. The pitch diameters are, however, and the shape of the threading tool should be. These two inspections cover the dimensions in a more practical way than by specifying them in tables to limits of one ten-thousandth of an inch.

8—*Tolerances on Minor Diameter of Nut*—The tolerances on minor diameter of a nut of a given pitch will be one-sixth of the basic thread depth regardless of the class of fit being produced ($\frac{1}{6}h$ or $0.10825p$). The maximum and minimum minor diameters are determined by the conditions set forth on Page 11, Par. 4 of this report. In the case of a punched hole the average diameter of the hole shall govern.

The next installment of this series of articles will deal with special threads and some additional general considerations.

Industrial Cost Accounting for Executives

By PAUL M. ATKINS

Article twenty-four—Mechanical labor saving devices—The reason for the use of adding, calculating and tabulating machines—The use of the schedule sheet

MODERN AMERICAN business is noted for the quickness with which it takes to labor saving devices. The accountant has been among the last to follow the lead and make use of mechanical aids to save time and labor. There are far too many offices where the adding machine even yet is unknown and where columns of figures are still laboriously added by the mental effort of the bookkeeper. Perhaps because cost accounting is such a comparatively recent development, and hence has not been hampered by tradition, it has taken more quickly to new devices, and hence we find few cost departments which do not employ labor saving equipment to a greater or less extent. There are some, however, in which the full possibility of the economic utilization of labor saving devices has not yet been realized.

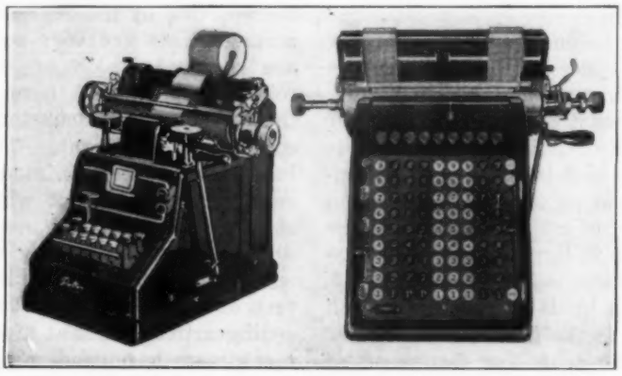


FIG. 55—ADDING MACHINE WITH TEN KEYS. FIG. 56—ADDING MACHINE WITH NINE KEYS ACROSS.

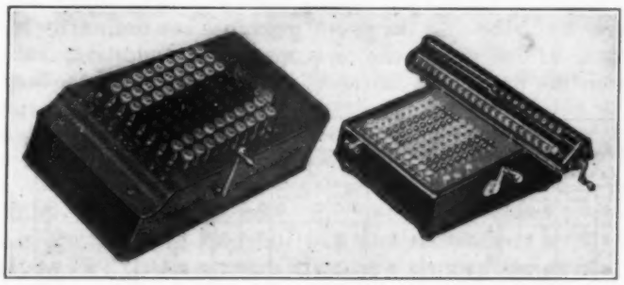


FIG. 57—EARLY TYPE OF CALCULATING MACHINE. FIG. 58—ANOTHER TYPE OF HAND-OPERATED CALCULATING MACHINE

There are two essential motives for the use of mechanical equipment in the operation of the cost department. In the first place there is the possibility of greater speed in the performance of the work and the preparation of the reports. The executives are beginning to realize that cost figures which are not ready till long after the close of the period in which the work was performed are interesting historical records, but are of very little value in the control of the business. Hence everything which can be done to increase the speed with which costs may be presented without the sacrifice of accuracy is worth careful consideration, and is frequently worth adopting even though it is more costly in operation than a slower method.

The other motive on its face is humanitarian—the saving of fatigue on the part of the employees redounds in a positive though indirect advantage to the employer in the form of greater accuracy. It is impossible for a person to work both rapidly and accurately when he is fatigued and hence labor saving devices make possible the assurance that reports are correct even though quickly prepared. We see, then, that the use of mechanical devices for the recording of costs leads to possible economies from several points of view.

It seems desirable, therefore, to call attention to some of the uses which may be made of labor saving equipment in the cost department, and, at the same time to point out some of the limitations thereon. The manufacturers and distributors naturally wish to present to prospective customers the extreme limit of the capacity of the equipment which they are producing, and hence they often recommend their machines for uses which are possible but which are not economical. Every factory man is aware that certain machines in the shop are capable of turning out tasks which are much more economically and efficiently performed on others. The same rule holds true in the office, and while it is possible, for example, to multiply on an adding machine and add long columns of figures on a non-listing computating machine it is not efficient to do either. The equipment should be chosen to meet the needs of the task in hand.

Of all the classes of mechanical devices in use in a cost department, the so-called listing adding machine probably has the largest variety of uses. There are few tasks which are slower, more fatiguing, or more likely to result in inaccuracy than to add long columns of figures in one's head. Long practice will permit a person to develop remarkable speed and accuracy but it is a waste not to direct the energy involved into more productive channels.

There are several varieties of adding machines, each of which has peculiar advantages in one way or another. There are machines which are operated by hand, and others which have the mechanism motivated by means of an electric motor. If the machine is to be used for any great consecutive length of time there is no question but that the power driven model is the more desirable for the physical labor involved is very much re-

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duced. On the other hand, it is possible in most cases to develop greater speed with a hand-driven machine, and the first cost is, of course, materially less. The power consumption of the power-driven variety is not very large, but if many of them are used it is an item which must not be overlooked.

Adding machines may also be divided according to the arrangement of the adding keys. There are ma-

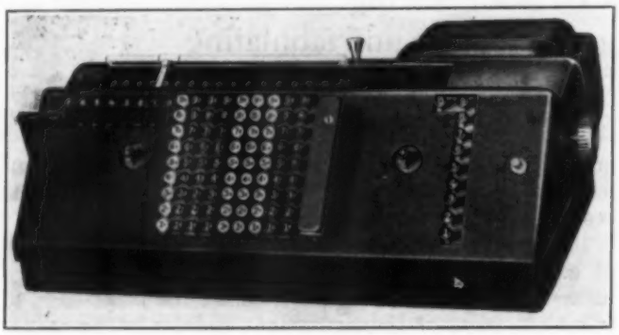


FIG. 59—POWER-DRIVEN CALCULATING MACHINE

chines which have nine keys—one for each number from 1 to 9—to each adding space on the machine, the zeros, when they appear, being printed automatically. A machine of this type is shown in Fig. 56. Another type which has become more or less standard now is one which has but ten keys, 0 to 9 inclusive. The number to be added is entered just as it would be written long hand, it being necessary, of course, to depress the zero key whenever one appears in the number. An illustration of this kind of machine is shown in Fig. 55. There are proponents of both kinds of machines, each stating that his favored kind is the faster. It is rather difficult to prove either to be true, for the speed of operation depends to a considerable extent on the operator and with the introduction of an individual we have brought in a factor which is composed of many variables. So far as we are concerned here it may be said the preference is pretty much a matter of individual choice, depending in a large measure on the particular charac-

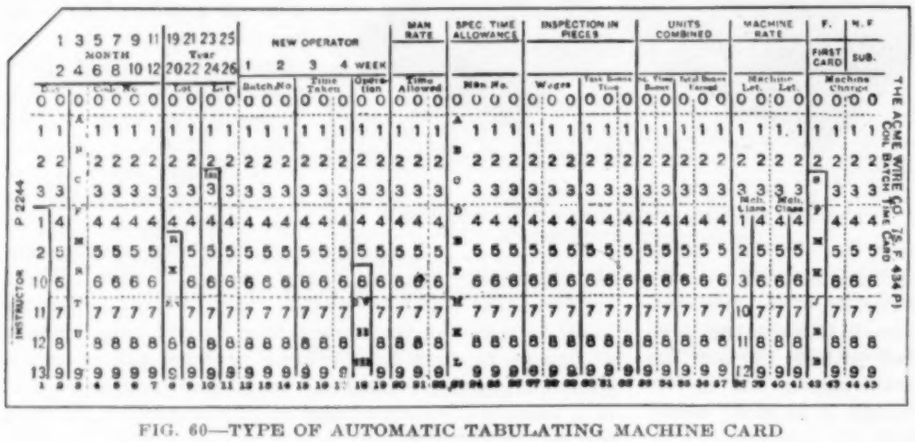


FIG. 60—TYPE OF AUTOMATIC TABULATING MACHINE CARD

teristics of the person making the decision. Both kinds have proved in practice to be entirely satisfactory.

The essential characteristics of all of these varieties of adding machines is the entering into the adding mechanism of the machine of the figure which is to be added by depressing certain keys, the addition by means of a crank operated by hand or power, and, at the same time, the printing of the figure added on a strip of paper. The total is given after all the figures have been added by depressing a "total" key and operating the crank once more, the total being printed just as the figures which were added were printed. Not only are the figures added, but a permanent, printed record is left of what they were. This makes it possible to check all additions to make sure that they are correct, but it also allows the preservation of the addition which is often wanted in the future. It is very convenient, for example, to have the record of the additions of the various cost elements for the orders, the operation which was described in the preceding article. It is the possibility of preserving the record in this form which renders unnecessary in many cases the copying of the detailed costs from the issues and time-tickets to the order cost-cards. A further illustration of this use will be mentioned in the following article in connection with the keeping of the material journal.

Sub-Total Mechanism

Most of the adding machines are so arranged that partial or sub-totals may be obtained at any point in the addition by the depression of the proper key. Such arrangements are very convenient when column totals are required which are to be carried forward to a following page but there is less use of this kind of thing in the cost department than there is in the accounting department. The arrangement which has been made on certain models of the Burroughs adding machines by means of which "transfer totals" may be obtained is usually of much greater value in the handling of cost accounting work. A description of the operation of this mechanism and its application to one task of the cost department has been given in the preceding articles, so that it seems hardly necessary to add much more here concerning it, except to say that there are many occasions when it will be found useful.

The second class of machines which are used largely in the cost department are calculating machines. These machines can ordinarily be used for all four arithmetical operations—addition, subtraction, multiplication, and division. It is for the last two that they are principally employed since for addition the adding machines are usually more satisfactory, and it is seldom any aid to use machinery to aid in making subtractions. These calculating machines can also be divided into groups in much the same manner as the adding machines. There are both hand-driven and motor-driven varieties, and differences in kind of keyboard.

One of the earliest and one of the most popular of the calculating machines is the Comptometer, shown in Fig. 57. It is a hand-operated device arranged with a nine-bank keyboard. The calculations are made by depressing the keys representing the multiplicand as many times as is indicated by the multiplier, moving the hands from right to left to include each digit in the multiplier. The product is shown in windows at the foot of the column of keys, but no permanent record of any kind is made. Hence the only way that one can be absolutely sure that the operation has been correctly

performed is to do it over again and compare the two results. Various safety devices have been developed which eliminate the possibility of making certain mistakes and greatly reduce the probability of others, and also facilitating their correction if made, but no proof is sure except repetition. This type of machine also has a considerable range of usefulness for making additions of comparatively short columns of figures. In fact, for a few figures it is possible to perform the addition twice in less time than it requires to enter the numbers on a listing adding machine and to check back to verify. After a certain number of figures has been reached, however, the listing machine becomes more valuable for this purpose, especially when the person using the machine is not an expert.

Another type of hand-operated calculating machine is that shown in Fig. 58. Here there are banks of keys as before, but once a key is depressed, it stays so till the calculation has been made and is then released. The operation is performed by turning a crank and the product or quotient or whatever the result may be appears in a set of windows while the other figures used appear in another set. The machine in this sense is self-proving for when the calculation has been completed, all figures are in view at the same time and a glance will show whether or not there is any error among them. If there is not, then the result must be right. This type of machine may also be used for addition, but it is rather slow and not very satisfactory for this purpose when adding machines are available. It is extremely versatile, and it is easily possible to extract square or cube roots and perform other operations quite beyond the capacity of most other types of machines.

So far as the writer knows there is only one power-driven calculating machine. It is illustrated in Fig. 59. In general arrangement it is very much like the machine described in the above paragraph, except that its mechanism is operated by an electric motor instead of by hand. Because of its somewhat greater complexity, also, it is not quite so flexible. Whenever it is necessary to make extension for any length of time, especially when the figures are large, this machine is most convenient and relieves the operator of a great deal of fatigue. This machine is also of the self-proving variety.

If the adding of long columns of figures is fatiguing and hence expensive, the extending of one figure by another offers rare opportunities for making mistakes when the pencil and paper method is the one employed. In the cost department these machines are a great boon for there is a large amount of this kind of work to be done. The making up of the payroll, the allocation of the earned burden, the extension of the time tickets, material issues, credits and worked material in slips are illustrations of the places where the calculating machine is almost indispensible. In the figuring of unit prices where the problem is one of division instead of multiplication these machines are also extremely useful, and whenever a short list of figures are to be added the type of calculating machine described is very handy.

In addition to these two classes of machines which are almost sure to be wanted in every cost department,

OCTOBER · COST DEPARTMENT SCHEDULE SHEET

TASK	2	3	4	5	6	7	9	10	11	12	13	14	16	17	18	19	20	21	23	24	25	26
MATERIAL JOURNAL																						
TICKETS SORTED																						
STORES ISSUES EXTD																						
STORES CREDITS "																						
W M ISSUES "																						
W M CREDITS "																						
W M IN SLIPS "																						
TICKETS ENTERED																						
SORTING & FILING																						
STORES ISSUES																						
STORES CREDITS																						
W M. ISSUES																						
W M CREDITS																						
W M. IN SLIPS																						
TIME TICKETS																						
VOUCHERS																						
TOTALING & POSTING																						

FIG. 61—COST DEPARTMENT SCHEDULE SHEET

there are other mechanical devices whose utility will depend largely on the nature of the records to be kept. Perhaps the most important of this class of machines is the automatic tabulating machine which automatically sorts the tickets which are put into it in any manner decided upon, and then in another part of the machine adds the figures according to the sorting which has been made. When this machine can be used it does away to a considerable extent, though by no means wholly, with the need of adding machines in the department. It is necessary to have all tickets used with this machine of a special variety, as shown in Fig. 60, and specially punched to record the data since the sorting and tabulating is done by electric contacts made through the punched holes. This means ordinarily that all tickets must be made out twice—once in long hand when the original record is made, and once again when the special tickets are punched. It may at once be seen that there are limitations on the use of this machine for it will take a considerable gain to offset the double entry of all information. If only one figure for one compilation is to be taken from a single card it is hardly worth while to use this equipment. If two or more figures can be taken from a single card or if one figure is to be used in more than one table then the benefits to be obtained are proportionately increased and its use deserves much more serious consideration. It must be remembered, however, that this equipment can work with astonishing rapidity so that unless there is a mass of detailed material to be handled it can hardly be kept going more than a small part of the time. As its cost is considerable, this is a point which deserves careful consideration in deciding on its use.

The typing-adding and calculating machines which

are not infrequently found in billing departments are sometimes of value also in a cost department. Whenever there are many reports to be made out the use of one of these machines means that the work is proved as soon as copied. They are also sometimes useful for making the entries on cost sheets or cards, doing away in this fashion with one addition on the adding machine. They are expensive, however, and their utility should be carefully evaluated before they are acquired.

In the payroll section of the cost department two other kinds of equipment are often very helpful. One of these is the type which provides a chart in one form or another with the extensions of the rates of pay in use in the factory by the entire range of hours at such intervals as may be desirable. A device of this kind does away with the necessity of the use of calculating machines in the payroll section and usually proves more economical in time. The other device referred to is an automatic addressing machine—a machine which ordinarily is employed for addressing envelopes when repeated communications are addressed to certain parties. In the cost department this device is used for making out the payroll, printing name, number and rate of each, and it is often employed also to print the name and number on the pay envelope. It is obviously a great time and labor saving implement in this place.

The preparation of reports has already been mentioned in one connection. Whenever it is necessary to prepare many copies of reports some of the various duplicating machines on the market prove to be very useful. These machines also assure the correctness of all copies providing the first has no mistakes, and their use provides means for rapidly producing copies after the report has been completed.

The filing of material in the cost department is an important task. It differs fundamentally in many respects from the filing of correspondence or other kinds of filing which are likely to be found in various departments of the company. To a very considerable degree, however, standard filing equipment may be used provided adequate attention is given this problem when the forms to be used in the cost department are designed. Closely associated with filing equipment are devices to facilitate the sorting of the many tickets, some of which must be sorted several times before they reach their final destination.

The Schedule Sheet

Another device which should be used much more extensively in all departments in which there is routine work to perform, whether the periods into which it falls are daily, weekly, or monthly, is a schedule sheet for the various tasks. On such schedule sheet should be shown the various tasks to be performed and the working days of the month. Whenever a task is accomplished it is so indicated on the sheet and by reference to the dates at the top of the sheet it can be seen at a glance just how the work of the department is coming along. This form is illustrated in Fig. 61. When such a device is in use it enables the cost accountant to keep track of the progress of the work under his control with a minimum of effort; it permits him to see what tasks most need assistance, and to give them that immediate attention which will prevent their seriously hampering the other work of the department or of other departments.

One of the most important aids to cost accounting is the development of standard practice instructions in which should be recorded in permanent form the routine operations of the department and which serve for the instruction of the employees who are to perform the various tasks. This whole subject is so important that it justifies much more space being given to it than is possible here, and so the entire following article is devoted to it.

Machines Always Auxiliaries

The cost accountant would do well to give thoughtful consideration to the various machines and devices which may save labor in his department or aid him in exercising greater control. He must be careful, however, not to think that a full equipment of a variety of mechanism is a substitute for a scientifically planned system of cost accounts and records. They must be arranged first and then the labor saving devices introduced as a means of assisting in the carrying on of the work. The equipment exists for the benefit of the cost department, not the cost department for the benefit of the machines.

In giving illustrations of particular makes of equipment in this article it is not intended to give unqualified endorsement of them to the exclusion of other and possibly competing makes which may or may not be equally good as or better than those cited. The author has simply selected examples from his own personal experience which have given satisfaction in the work to which they have been put.

Editorials vs. News

By Entropy

It is said to be a sign of advancing age for a man to read editorials in the daily papers.

In spite of this I undertook some weeks ago to read editorials, not only in daily papers but in technical ones as well. May I say, publicly, that they are not so bad as they are painted, and that reading them is no more a sign of senescence than walking under a ladder is a sign of misfortune.

For the sake of the thousands of readers who have never tried this experiment, and who may be skeptical, I want to say that reading editorials is the proper way to get the news without the bother of reading it as it is spread at great length in the other columns. We all waste a great deal of time reading, for the simple reason that we are attracted by a head line and cannot tell whether it is best to read on until we have read the entire story. We may be intensely interested in the League of Nations, or herringbone gears, or horse racing, or overhead valves, but we cannot guess from the heading of the article what is contained therein.

The thing to do is to read the editorials and then, if they refer to anything that they do not wholly cover, read the articles on that subject. The editor is the chap that has to read a lot. We don't need to sympathize with him because he gets paid for it, but he reads a lot of stuff, and out of it he culls enough to fill up his space. But out of all that he reads, whether he prints it or not he is storing up impressions, he is making a sort of composite picture of what passes before him, and then he writes his editorials on the things that have seemed to him most worth while. He gives you in his columns, the boiled-down concentrated, and well-thought-out expression of all that you most want to know.

Transportation—The Master Key to Progress

BY EDWARD J. KEARNEY
Kearney & Trecker Corp.

The place of transportation in the progress of the world—Advances of the railroads in recent years—Continued progress depends on machine tool development and application

MACHINE TOOLS are called, and rightly so, the "Master Tools of Industry," but they are not a primary product, creating their own demand, or connected, except very indirectly with individual consumption. They are the instruments necessary to the creation of machines that themselves reach the final consumer, such, for example, as carpet-sweepers, automachines that are many times removed from the ultimate consumer, such, for example, as the steel mills that make the rails, that carry the locomotives, that draw the cars, that deliver to the consumer the carpet-sweeper, the automobile and the radio outfit. So it turns out that new developments to which we look to give impetus to our industry are not of our creating. When a new machine, or a more highly developed old one, presents a demand, either for greater precision of manufacture or increased production at less cost, we meet that demand and in that way make our contribution to progress.

During the last sixty years there have been many new developments that were of such magnitude and which came forward with such a rush, that they, together with production already established, created a peak demand for machine tools. Every one of these forward movements left the industry on a higher level than before. Among the developments that have given this added impetus to the industry that may be mentioned as examples are the sewing-machine, the electric generator and motor, the bicycle, and the automobile.

REACTION AFTER POST-WAR BOOM

The reaction following the artificial stimulus of the war and the post-war boom, when machine tools were in uncompromising demand, has not yet left us. Our suffering has been long and intense. The statistics which we began to gather in 1920 show that as compared with the first quarter of that year, the business of the third quarter of 1921 was only 10 per cent, due to both reduced prices and reduced volume. The gradual improvement that has been made since shows that our factories, taken as a whole, are now working at only about one-third of their capacity. Under such conditions, it is not surprising that many of our members have been forced into receiverships, and the strongest have seen their surpluses diminish, and, in many cases, their capital impaired. There are no figures on which to base the assertion, but it is my belief that a combined financial statement of the industry made now, as compared with three years ago, would show a shrinkage or net loss of at least 25 per cent in the total net value of the industry. When we met in annual convention three years ago, we had on our membership roll 209. Today, it is reduced to 135.

MACHINE TOOLS IN THE BUSINESS CYCLE

It is not known among business men generally that the machine tool industry suffers during the downward swing of the business cycle to a far greater extent than ordinary manufacturing lines, for the reason that our product is bought mainly during periods of expansion. The carpet-sweeper manufacturer, when his business shrinks 5 per cent, buys no more machine tools, so that our business, as far as he is concerned, falls 100 per cent. The example could be extended almost indefinitely. If we were sufficiently numerous to be of importance in our national elections, attempts would long ago have been made to capitalize our distress at the polls. Is it therefore any wonder that we are asking one another whenever we get together by two's and three's, "What is the next development that will sustain the machine tool industry?" Every one has an answer. I have mine. It is general, mechanical, industrial, and agricultural development and prosperity, with transportation the master key to progress. Unfortunately there are certain elements in our political life that would throw the key into the well and prevent entrance into that temple of well-being—"universal prosperity."

Future progress depends on adequate transportation facilities. So important is this that it should be a matter of the most serious concern of every businessman and citizen. It is this view that leads me to present an outline of the case and show where we can do something for ourselves and in the public interest.

There are few people not actively connected with railways or who have not made a study of their growth, who have any idea as to the enormous extent to which transportation in this country has grown, or to where it will lead with the present rate of growth continued. This is why we should be concerned.

It seems to be a part of our national genius to travel. This is due in part to the prosperity of our people, and in part to our universal educational system which carries with it the desire to see other sections of our country and other lands. For example, the Iowa farmer, when the corn crop is good and hogs are high, spends the winter at Long Beach, California. The Colorado

Delivered at Lenox, Mass., by its retiring President, before the National Machine Tool Builders' Association.

school teacher spends her vacation attending summer school at Columbia University. The Ohio business man goes South for a late and an early game of golf, and all of the newly-weds see Niagara.

In addition to this, the system of marketing our products has brought about extensive travel on the part of representatives of manufacturing concerns, wholesale, and others, so that railway travel, in spite of the coming of the automobile, is growing rapidly. In 1880 the per capita travel was approximately 100 miles, which has continued to grow steadily during each decade until it is now about 400. These figures show their true comparison when it is recollected that the population of the United States in 1880 was only 50,000,000, meaning that the number of passenger miles traveled at the present time is over eight times what it was in 1880.

The Freight Problem

When we come to the study of the subject of freight, we find a similar condition with the difference that the rate of increase is much more rapid. The per capita ton miles rising steadily during the period, multiplied itself about six to one. In 1880 the number of tons of freight hauled one mile was 32 billion (32,000,000,000); while it is estimated that for the year 1923 it will be beyond 415 billion (415,000,000,000), or 13 times as much.

Some investigators are of the opinion that the length of haul will diminish, owing to the tendency to establish factories in other than the strictly industrial sections and nearer to the point of consumption. This would have the effect of keeping down the ton-miles as compared with the number of cars loaded. But, on the other hand, the motor truck on hard roads is taking away many of the short hauls, tending again to lengthen the average haul. At the present time the product of the mine, the forest, and the farm furnishes 70 per cent of all the freight, and none of these can be moved. State traffic furnishes but 15 per cent of the whole, while interstate traffic furnishes 85 per cent. In this discussion passenger traffic would be eliminated if it were possible, but people will and must travel, and the high speed, preference trains furnished for their accommodation clutter up the tracks, increase the time and cost of getting slower-footed freight over the road, and consequently increase the number of freight cars and locomotives necessary for a given volume.

Future Transportation Requirements

Every factor in the economic progress of our country points to greater production, greater wealth, and higher standards of living; consequently, greater consumption, necessitating more and better transportation. There are ample grounds for the prediction that within 20 years we shall demand of the railroads the moving of twice the amount of freight carried today, or more than 800 billion ton-miles. In addition, they will be called on to provide for a 75 per cent increase in the passenger miles traveled. Given the vitalizing power of sustained credit, without which nothing can be done, is it a task capable of accomplishment? Will it be possible in this space of time to provide facilities to dispose of this overwhelming volume? Are there any improvements in sight that, if applied, will help to a solution?

Throughout the years of railroad building, when attention was principally given to the extension of lines and territorial development, locomotives changed mainly in size, the general construction remaining about the same. Each decade saw larger and larger locomotives in use, but all embodying approximately the same principles and methods of steam-making and distribution as were employed in the eight-wheelers of the sixties.

Investigation shows that improvements have now been made greatly increasing the economy and power of the steam locomotive. This has been brought about by adding new principles, such, for example, as superheating, which means that the temperature of the steam is raised above the temperature which it normally has when in contact with the water from which it is made, the additional heat added being entirely a gain in economy. This improvement has been applied to about 50 per cent of the locomotives now in use.

It may seem strange that such a simple device as a feed water heater, which has been used in stationary practice so long, has not been generally applied to locomotives. It must be remembered that the locomotive is limited to the width of the track upon which it runs, which cannot be made wider, and to the height and width of bridges and tunnels. Within this space everything that is to be attached to a locomotive must be placed, and it has taxed designers to the utmost to provide these extra devices within the limits allowed, and at the same time make them of sufficient simplicity to remain absolutely reliable in service and not too costly to maintain. This device is now applied to less than 1 per cent of the locomotives of the country, but will become universal.

Another Steaming Device

Thermo-syphon fire-box equipment, employed on a few locomotives, consists of large tubes which spread out into a fan-shaped structure connecting the crown sheet with the lower front part of the fire-box. Its effect is greatly to increase the circulation through and around the fire-box and over the crown sheet, the hottest part of the locomotive boiler, and therefore greatly increase steaming capacity. About 15 per cent can be added to the draw-bar pull at normal speeds by the use of this device. This also provides a support for brick arches which are now applied to 75 per cent of the locomotives in use.

The devices mentioned thus far are all for steam-making. By their combined use, either on new or old locomotives modernized, about 80 per cent more volume of steam can be produced with a given size boiler with the same amount of fuel consumption, which means that a 3,000-ton train can be increased to beyond 5,000 tons on the open road and proper speed maintained.

This picture is somewhat dimmed by the fact that these devices are of little or no value in starting the train, which requires a draw-bar pull of about 18 pounds per ton, whereas only about seven pounds per ton are required to keep it rolling when once started on straight and level track. Nor are they of any special use on the grade when the speed is reduced to near the stalling point, except on locomotives especially designed for heavy grades and low speed. Such locomotives are not adapted for service on the open road where relatively high speeds must be maintained to economize time and prevent congestion.

In order to enable the locomotive with its improved steam-making devices to get its enlarged train started and over the stalling grades, a mechanism has been applied called, in railroad parlance, a "booster." This is the newest development, and has been applied to only

a comparatively few locomotives, but quite sufficient to prove its value. In order to understand better its application and usefulness, it will be necessary to consider briefly the principle of locomotive-wheel arrangement for different kinds of service.

At low speeds the greatest tractive effort is exerted but owing to the low piston speed, less steam is needed; therefore, the switching locomotive has a comparatively small boiler and all the weight is carried on the drivers. The same principle applies to the so-called "Mallet" type, designed for mountain grades, where double sets of drivers and cylinders are placed under one boiler. Neither of these types is suitable for high speeds, as their boilers would not furnish a sufficient supply of steam.

In heavy passenger and fast freight service, the conditions are exactly reversed. The steam requirements go up with the speed, and the tractive effort goes down; consequently, large boilers are used and the weight carried in part on truck wheels, both front and rear. The rear set of wheels are called trailers and are smaller than the drivers in order to find accommodation under the fire-box, which places a limit to the rearward extension of the drivers. When the train is being started, or running on grades or sharp curves at very low speeds, then all of the tractive effort possible is needed. Under such circumstances there is a surplus of steam. These are conditions where the booster comes in. It is a double cylinder steam engine, spur geared to the trailing wheels at a ratio of three or four to one, by means of shifting gears, which automatically disengage when not wanted, leaving the trailing wheels to run free. Its action, when engaged, is very much like an automobile running in low to pull itself out of the mud. About 25 per cent is added to the draw-bar pull at speeds under 12 miles per hour on a locomotive with eight drivers coupled, providing that the trailers carry the same weight as each pair of driving wheels. The effect of the booster is to start a longer train with less shock due to slack taking, and take it over a steeper grade without stalling.

Electrification of Railways

The electrification of railways fascinates the popular mind, and for this there is ample justification.

Improvements in the steam locomotive, such as we have been considering, postpone the day of its extinction into the distant future, if, in fact, it ever takes place. Both the electric and the steam locomotive are sure to have a huge part in speeding the mighty stream of traffic that flows in an ever-increasing flood from state to state and onward to the sea. The use of electric locomotives will increase, for a very good and simple reason. It takes six or seven times as much draw-bar pull to take a train over a 2 per cent grade, as it takes to move it on the level. If the train is to go through unbroken, it requires double and triple heading, pushing and double pushing. With all this extra power, the speed is reduced to a crawl, congesting the line at a point where double tracking or quadruple tracking is liable to prove difficult and expensive, as these are the points where tunnels and other obstructions are most likely to be found.

With electricity, power without limit can be concentrated, train speeds maintained, and the heavy grades cease to be a limiting factor on the line. Many other things can be said in favor of the electric locomotive, such, for example, as its ability to stay in service and make long runs. Its one drawback is cost of installation, which is many times more than is required for steam; so that at present, and perhaps for many years to come, it will best justify itself on mountain grades, tunnels, and terminals.

Sidings, Switches and Signals

Improvements in the capacity and economy of the power are of comparatively little avail unless there are also corresponding improvements in other portions of the whole mechanism of the railroad. Long, heavy trains can not be sent over single or double track lines unless sidings are supplied in sufficient quantity and size to take care of them, and provision made for their speedy operation.

Thousands of miles of railway are without block signals. These were first introduced purely as a safety device but have now become necessary for the expedition of traffic over congested lines. In the pioneer days, when trains were few and small, there was no great loss if the train came to a full stop when taking the siding, giving the brakeman opportunity to run ahead and turn the switch, and for the train to pull into the siding and move out again after the meeting had been made, making a third stop for the brakeman to close the switch and catch the rear end of the train. But when it is a congested line with 5,000 tons of freight and a modern power unit, it becomes a matter of very great importance and can only be handled to the best advantage as regards economy, expedition, and safety, by interlocking switches and signals in control of an operator near the siding or several miles from it. In other words, the time is at hand when trunk-line railways must cease hand operation and adopt machine operation for economy and quantity, sending trains from one track to another, or in and out of sidings by the push of a button in place of the slow methods of the past.

These are only a few of the outstanding improvements that are possible of being applied to the task of greater and more economic transportation.

Developments in operation will lead to the placing of Chicago, Pittsburgh, Kansas City, and other restricted gateways on stub tracks, the main line passing them by.

One of the greatest economies in railway operation is to keep the equipment in use the greatest possible amount of time. In our own business we recognize the value in reduced overhead when our equipment can be used full time, or better still with more than one shift. The same is true of railway equipment. In order to bring this about, there must be facilities for taking care of locomotives at the terminals so that they will be the least possible time out of service. This means better and larger round-house facilities, sanding and coaling devices, boiler washing equipment, and last, but certainly not least, modern machine tools for both the round-house shop where temporary and emergency repairs are made, and for the general shop where thorough overhauling is done.

Is Management Incompetent?

It has been shown that there are improvements in equipment actually tested and to a limited extent in use to warrant the conclusion that there are no engineering obstacles to more, better, and relatively cheaper transportation. Reference is frequently made in certain quarters to the incompetency of railroad management. Let us see as to that. Since taking back the

roads from the government on March 1, 1920, the number of employees has been reduced by 150,000, while the amount of traffic being moved at the present moment is the largest in history, with a steadily rising car surplus for the October peak. This hardly looks like incompetence.

The only thing that stands in the way of growth of transportation facilities is lack of capital. No arguments are necessary to convince you that the capital will be forthcoming if there is prospect of security for the investment and a continued return satisfactory compared with what can be obtained in other industries. The selling methods of our political leaders have not improved as rapidly as have those of the makers of some less important commodities, with the result that the people are misinformed and led to believe false economic doctrines. When any considerable class is adversely affected, such for example, as the wheat growers or the coal consumers, what is the first suggestion for relief? Take it out of the railroads.

In the Transportation Act of 1920, Congress places the regulation of the railroads in the hands of the Interstate Commerce Commission with instructions to see that no injustice is done any shipper; also charges them with an equally important duty of seeing that the railroads receive a return, which will attract capital sufficient for adequate growth and development.

Mechanically the railroads are on the way to handle the ever-increasing volume of traffic and to do it so much more economically as to give promise of ultimate freight rate reductions. Our opportunity is in using our influence with those in authority to promote and maintain a government policy favorable to the development of transportation, the master key to progress. Vital to mechanical progress by the railway is the investment of vast capital. Underlying such investment is confidence in the stability of railway income. Behind this in turn is stability of government policy. Efforts are being made to repeal the Act or so to amend it that the revival of railroad credit will be impossible and public interest suffer irreparable damage. Some men in public life do not seem to know that one dry bearing will be just as disastrous to the operation of the whole machine as if no oil were used at any point. The immediate objective is a further trial of the Transportation Act without experimental amendments. In future years the objective is so to guide the progress of perfecting the law that always embedded in it will remain the principle of net income adequate for the attraction of capital.

Can you not picture a shrinking map with the Missouri Valley products only 48 hours from Atlantic harbors? Can you not visualize with the prosperity incident to these developments an enormous increase in the use of mechanical equipment on the farm, in the home, on the railway, in the air—wherever there are tasks for human hands to perform? Does this not mean that the manufacture of machine tools will become a more stabilized industry depending less on the activities of any one line and more on the general prosperity of all the people?

Progress of the Investigation of Phosphorus and Sulphur in Steel

The Joint Committee on the Investigation of the Effect of Phosphorus and Sulphur in Steel has just issued a statement regarding the progress of its work. This statement is the fourth that has been issued by the committee, and gives some of the details regarding the work that has been performed and that is contemplated.

The work of the Joint Committee is being carried on largely under the direction of the United States Bureau of Standards, in whose reports the final results will be broadcasted. Besides the United States Departments of War and of the Navy, there are eight national engineering societies interested in the standardization work, and co-operating in it.

The work which the committee is doing has been planned to cover a broad field, and to supply data for the use of both the makers and the users of steel. There are two general series of tests, the first one, Series A, dealing with the effects of sulphur and phosphorus upon steel when sulphur is residual, meaning that it is present in the steel through the fuel or from the pig iron or scrap that enters into it. The second, or Series B steel, is that in which sulphur has been added during the later stages of manufacture before the metal reaches the mold.

In addition, there are six groups of tests, each for a different grade of material. The carbon content in per cent in the different groups is as follows: (1) Rivet steel, tubes, etc., 0.06 to 0.12; (2) plate and structural shapes, 0.16 to 0.22; (3) forgings, 0.45 to 0.55; (4) wheel, tire and rail steels, 0.65 to 0.75; (5) spring steels, 0.95 to 1.05; (6) castings, carbon content to be determined.

In all of the groups, when determining the effect of sulphur, the sulphur content ranges in general from 0.03 to 0.08 per cent, with the phosphorus and other elements normal and as nearly constant as possible. When determining the effect of phosphorus, the phosphorus content ranges from 0.02 to 0.08 per cent, while sulphur and the other elements are held normal and as nearly constant as possible. The use of Series B is to provide for higher sulphur contents than are usually obtainable with residual sulphur only, thus making it possible to compare the effects upon steel of residual and added sulphur.

So far, the investigation has been confined to a study of the effect of sulphur upon steel. Material has been secured in Series A for the first three groups, and in Series B for the second, third and fourth groups. The test programs for Series A Group (1) and for Series B, Group (2), (3) and (4) have been practically completed. Tests are well under way now for Series A, Group (2), and those for Series A, Group (3) have just been started. Plans are now in progress to secure the material for Series A, Group (4). It might be noted that considerable thought is being given to the plans for the tests and that all contingencies are, if possible, cared for in advance. Every step of the program must be acceptable to all parties in the committee that represent different organizations.

The tests are being carried on at various points best suited for the work, and in most cases are being made in duplicate, so that a good check may be obtainable. At present, of course, no results nor indications from the tests can be given. The statement made by the committee at present tells only the details of the tests and the conditions surrounding them. The complete information, regarding both the tests and the results, will later be published in technologic papers of the Bureau.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Sharpening a Large Cutter

BY MILTON WRIGHT

Inserted tooth milling cutters of large size are difficult things to handle in resharpening operations unless a machine specially designed for the purpose is available. The illustrations herewith show how one such

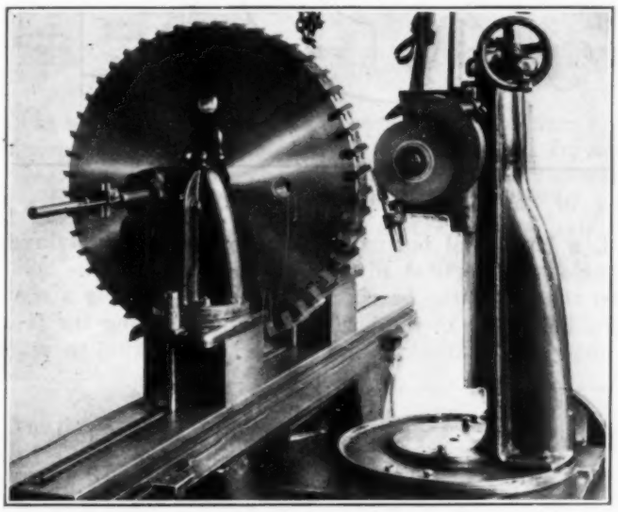


FIG. 1—GRINDING THE TEETH ON THE PERIPHERY

job was accomplished in the shops of the Brown & Sharpe Manufacturing Co., Providence, R.I., using a standard machine supplemented with a part from another machine of the same type.

The cutter is 24 in. in diameter by 3 in. face. It is

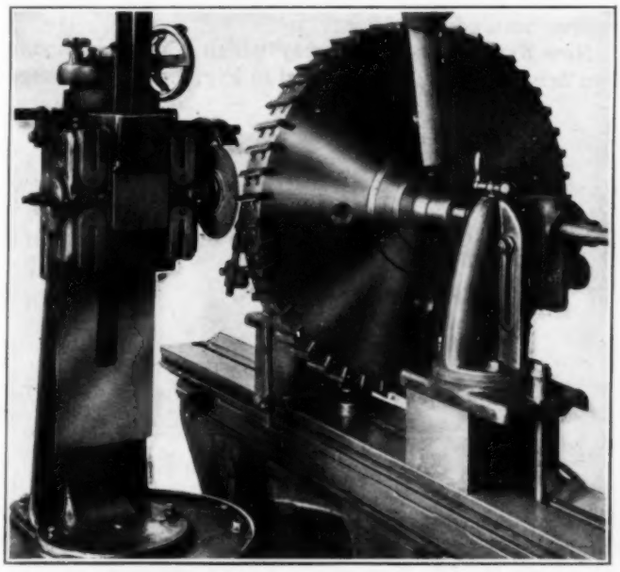


FIG. 2—GRINDING THE TEETH ON THE SIDE

shown in Fig. 1, set up for grinding the teeth on the periphery, on an N-13 Brown & Sharpe grinding machine with high column; being supported on centers that are clamped in the V's of two universal heads, one belonging to the same machine and the other borrowed from an adjacent machine.

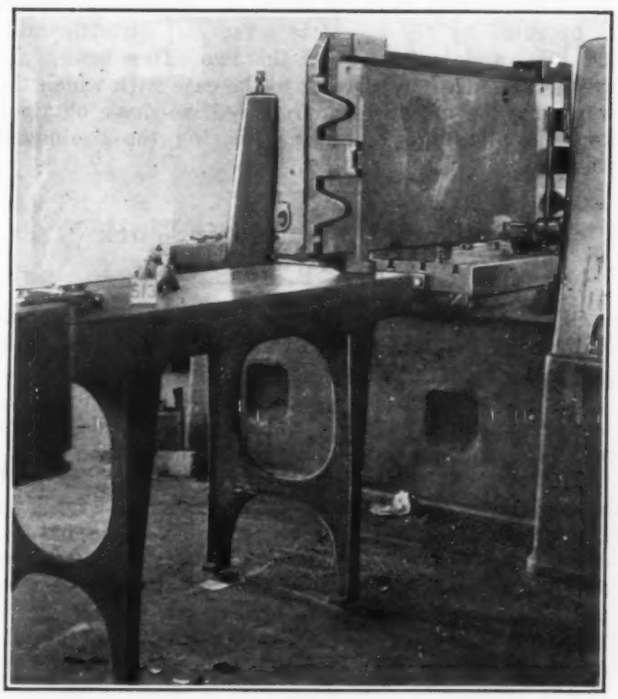
The heads were not high enough of themselves, and it was necessary to insert 4-in. raising blocks under each in order to swing the cutter clear of the table. Fig. 2 shows the set-up for grinding the teeth on the side; all the change necessary being to swivel the column of the machine 90 deg. and alter the position of the finger rest.

The time for setting up and grinding the cutter complete was 5 hr. The wheel used was a Norton Alundum, 3860-I, 6 in. diameter by ¼ in. face.

Large Work on a Medium Size Machine

BY HAROLD BROWN

The accompanying illustration shows a boring job set up on a 54-in. horizontal boring machine using a surface plate to help support the casting being machined. Screws in the legs of the surface plate were used for



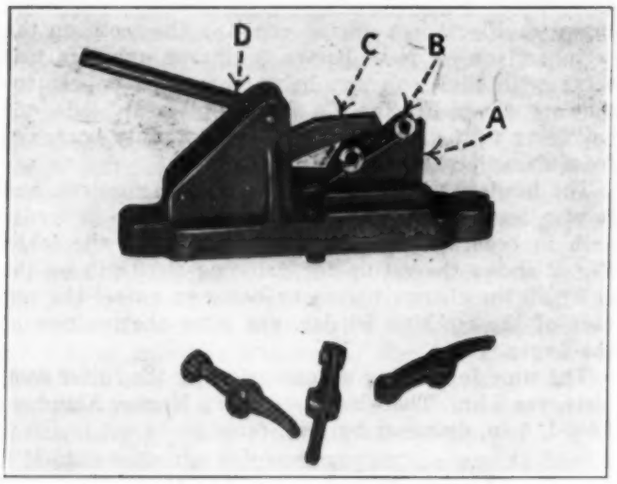
SUPPORTING LARGE WORK ON A MEDIUM SIZE MACHINE

leveling and, by means of an indicator, it was set to the height of, and level with, the table of the boring mill. This arrangement has worked out successfully on more than one occasion.

Milling Valve Lifters

BY EDGAR ALLEN

An order for a large number of drop-forged valve lifters was obtained by our shop management not long ago. We were a little puzzled at first just how to mill the bosses, but finally made the holding fixture shown. The body of the device is made of cast iron and the



VALVE-LIFTER MILLING FIXTURE

work holder *A* is made of machine steel and the parts on which the valve lifter *B* comes in contact, case-hardened. This work holder is just a milled block, channeled to receive the lifter and has rounded hollows on its upper surfaces for the bosses to rest in. The channel and recesses are all the locating points needed. The lifter is held down by means of the clamp *C*, which is operated by the eccentric lever *D*. Straddle mills are used and both ends of the two lifter bosses are finished at one pass. Owing to the ease with which the work may be inserted and removed, we have obtained an unusually high output considering the equipment we have.

Railroad Shop Repair Work

BY I. B. RICH

On a recent visit to the shops of the Union Pacific Railroad in Portland, Ore., I ran across several interesting methods of handling work. One is the method of planing the tongue and groove on the eccentrics so as to insure fitting together, and to prevent side motion when they are assembled on the driving axle.

The method of planing these is shown in Fig. 1, where very simple fixtures, *A* and *B*, are used for holding the two parts on the planer table. The fixtures consist practically of substantial bases with tongues fitting the planer table slot, and provided with steel uprights which act as jaws for holding the eccentrics. Suitable setscrews provide means for clamping the eccentrics in the jaws shown. With the halves of the eccentrics held in this manner, it is an easy matter to plane the joints at one setting.

The crown brasses used in the driving boxes are provided with two strips of babbitt, as in *A*, Fig. 2, and in addition have the center of the bearing relieved, as at *B*, for the purpose of permitting the lubricant to flow freely along the length of the bearing. Also the sharp corners at *C* are cut out with a view of preventing them from acting as scrapers and removing the lubricant.

The method of boring these brasses is shown in Fig.

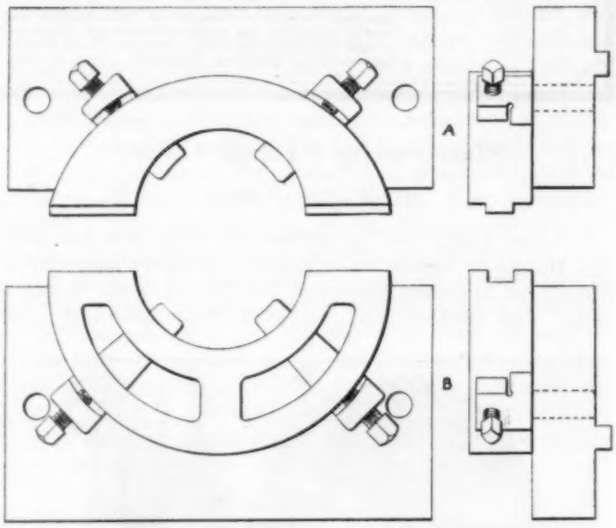


FIG. 1—FIXTURES FOR PLANING ECCENTRICES

3, a horizontal boring machine of the type having a table with vertical adjustment being used. The relief at the top of the bearing is secured by putting a short radius cutter in the boring bar and lowering the table until the desired relief has been secured. The relief

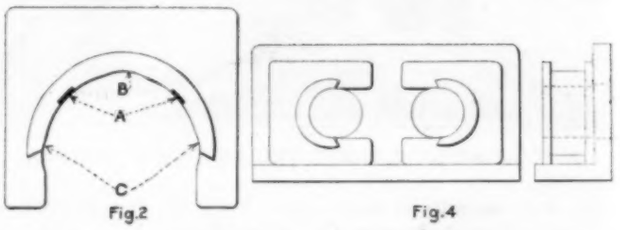


FIG. 2—RELIEVING DRIVING BOX BEARINGS. FIG. 4—LAYOUT OF NEW FIXTURE

at the corners is also cut at the same setting by raising the table and using a cutter with sufficient radius to relieve both corners.

New fixtures are under way which will accommodate two driving boxes, as indicated in Fig. 4. This arrange-

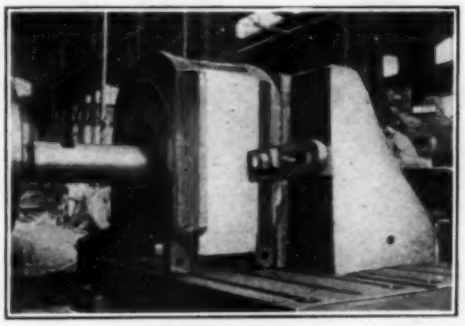


FIG. 3—BORING THE DRIVING BOXES

ment will permit the setting of one driving box while the other is being bored, and in that way practically eliminate the idle time of the boring machine.

Hub liners are a little out of the ordinary, having babbitt inserts as shown in Fig. 5. These inserts are staggered as shown.

When it came to removing a driving wheel from an

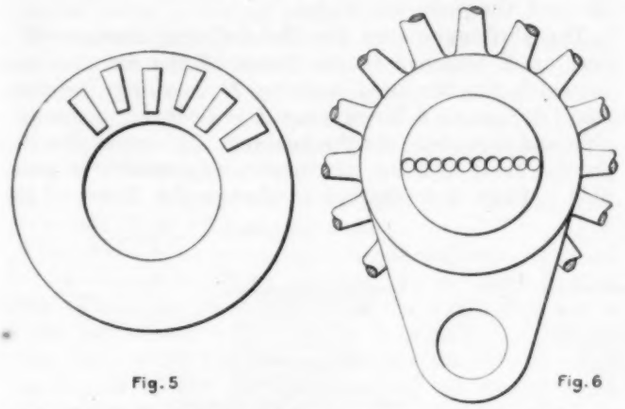


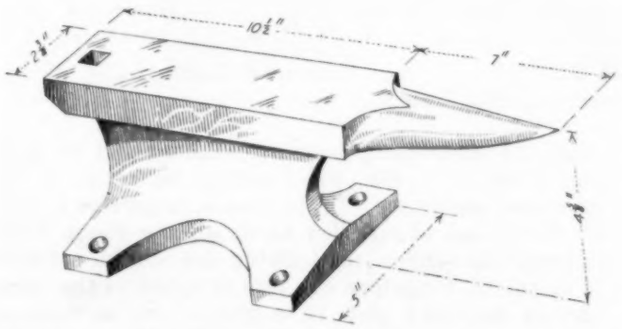
FIG. 5—STAGGERED BABBITT INSERTS IN HUB LINER.
FIG. 6—REMOVING A TIGHT DRIVING WHEEL

old axle, it was found that the normal maximum pressure of the press would not start the wheel from its seat. In order to make it possible to remove the wheel without danger of breaking the press, a row of 1-in. holes was drilled across the center of the axle, as in Fig. 6. This made it an easy job to remove the wheel.

Making Anvils from Old Rails—Discussion

By Wm. T. Guenther
Machine Shop Instructor, Eveleth, Minn.

On page 742, Vol. 58, of the *American Machinist* is a sketch presented by Frank C. Hudson of an anvil made from an old rail by students at the University of California. The students of our Manual Training School have not only made several anvils, but have



USEFUL ANVIL MADE BY STUDENTS FROM OLD RAIL

made them as per the accompanying sketch, with a regularly tapered horn, hardy hole, and such points.

The rail was roughed out in the machine shop, the horn shaped in the forge shop, and then it was brought back to the machine shop for finishing. The shaper was used on the top, sides and bottom, the rest being done with a file.

This anvil not only provides a very fine problem for the students, but it is a most useful tool in the private garage or around the average home where the man of the house does some tinkering.

Trimming a Metal Box Cover

By Paul A. Bard

Having a quantity of sheet steel box covers to trim, and lacking better facilities for doing the job, the Co-operative Machine & Tool Co., Minneapolis, Minn., performed the operation with the tools shown in Fig. 1. The fixture *A*, which is screwed on to the spindle nose, is a casting having a four lobed cam on the spindle end and a square section on the opposite end, the latter

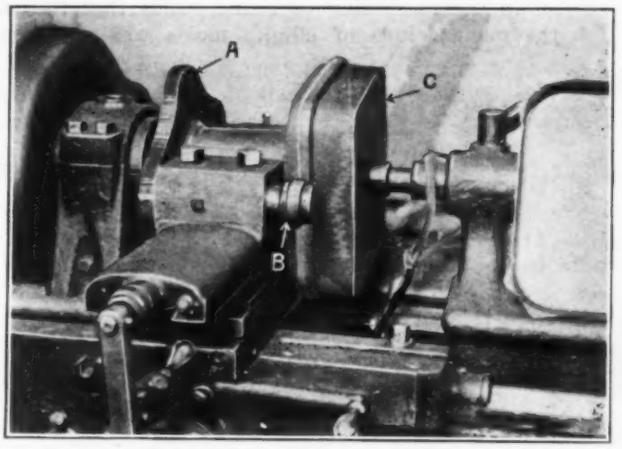


FIG. 1—THE TRIMMING TOOL SET UP

being machined to fit the box cover. Clearance was allowed for the edge of the cutter *B* as shown in Fig. 2. The cutter, which is of highspeed steel, has a section that acts as a cam roller and keeps the cutting edge in the proper relation to the work. The cutter is located on a stud having a large head, the stud being screwed into the side of a block on the compound rest as shown. A cam roller is attached to the rear end of

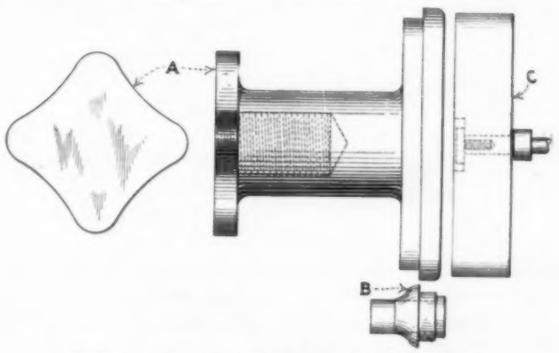


FIG. 2—DETAILS OF TRIMMING TOOL

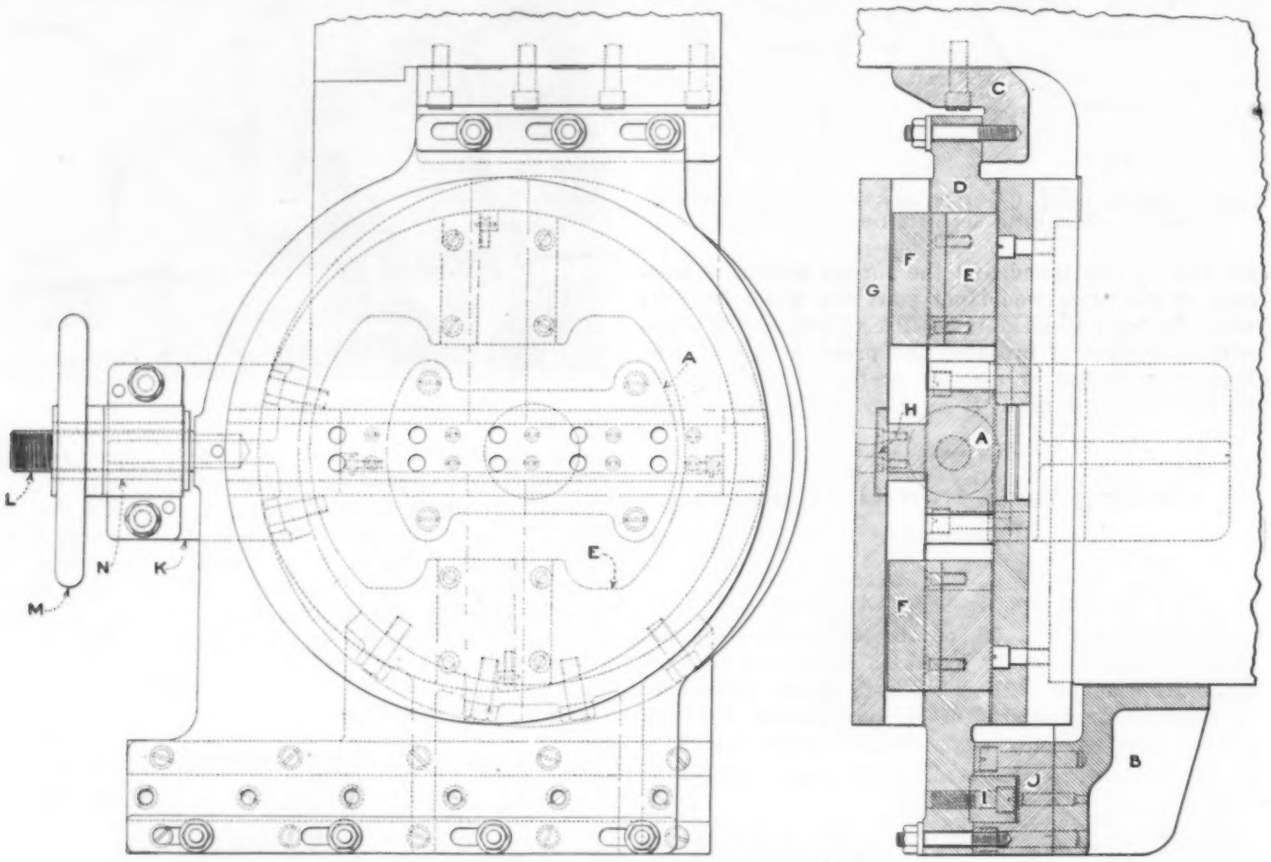
the base of the compound rest, at the left side, where it contacts with the cam *A*. The cast-iron block *C* is rotatably attached to a taper shank fitting into the tailstock spindle, and is forced against the work to hold it in place while in process.

The nut having been released from the cross-feed screw, the compound rest is fed in until the cutter is in contact with the work, then the piece is revolved and the cutter trims the cover. The cam action of the cutter on the work moves the tool slide in one direction and the cam *A* and its roller moves it in the opposite direction. The relation of the cam *A* to the fixture is such that the high points on the cam alternate with the corners of the piece and thus keep the cutter against the work.

Vertical Turret Lathe Elliptic Chuck

By F. E. Bardrof

Many of the dishes included in the line of Pyrex baking ware manufactured by the Corning Glass Works are elliptic in shape and, in making the molds for this glassware, it is necessary to hold the parts to be machined in an elliptic chuck. The Bullard vertical turret lathe was adopted some time ago by the shop for turning glass mold parts and its use proved so successful in the machining of round molds that its use for the manufacture of elliptic molds was also considered. Since no elliptic chucks now on the market could be adapted for use on the vertical turret lathe, a chuck embodying some novel features was designed and built into a new lathe.



VERTICAL TURRET LATHE ELLIPTIC CHUCK

The main features of the chuck are shown on the drawing herewith. The standard chuck was removed from the lathe spindle and the tongued guide *A* was securely fastened and doweled to the spindle plate. A bracket *B* for the bullring guide *J* was fastened to the front of the frame as shown and a bracket *C* for fastening down the back of the bullring was fastened to the frame below the turret rail. The bullring *D* carries a long heavy key *I* on its front side which fits into the guide *J* and causes the bullring to move parallel to the guide when the holding bolts are loosened. The bullring centers the guide ring *E* which carries lugs *F*. Lugs *A* and *F* slide in right-angled slots in the chuck plate *G* when the spindle turns and these slots are fitted with hardened gibs to take up wear and keep the mechanism in proper alignment. The slot for the lug *A* is also T-shaped to admit the plate *H* which is fastened to the lug block *A* and holds the parts down. Ordinarily there is practically no load on this plate as the weight of the parts keep them down but, in order to prevent any chattering and to allow undercutting by the tool, the plate was added.

The shifting means for the bullring consists of a bearing *K* attached to the frame of the machine and in which the threaded bushing *N* carrying the hand wheel *M* turns. A large screw *L* is fastened to the bullring and threaded into the bushing. By means of a dial on the hand wheel a micrometer adjustment is available. When it is desired to change the throw of the chuck the seven clamp bolts are loosened and the bullring is moved to the proper setting by means of the handwheel and screw. In the final arrangement a piece of sheet steel was drilled to fit on the clamp bolts, covering the slots in the bullring against the entrance of chips. A felt wiper was also attached to the lower edge of the chuck plate *G* to prevent the entrance of chips between it and the bullring. The four-jaw independent chuck, which is a standard equipment on these lathes, was fastened to the chuck plate *G*.

In assembling the chuck on the lathe the bracket *C* was fastened to the frame with its upper face parallel to the turret rail. The bracket *B* was then put on with its upper face also parallel to the rail. The guide *J* was then doweled to the bracket at the proper distance from the center of the spindle and with the slot parallel to the rail. The bearing *K* consists of two halves separate from the bracket. The threaded bushing and the split bearing were, therefore, assembled on the screw and the bullring placed in position with the key *I* in the groove of the guide *J*. The split bearing was

then doweled and fastened to its bracket, and the holes for the bullring clamping bolts were spotted through the bullring. Although the parts were large and heavy and the brackets were fastened to the rough frame castings, no particular trouble was experienced in getting the parts to line up properly.

The guide ring is lubricated by an oil cup attached to the bullring and the chuck plate slots are lubricated through oil holes. By throwing the bullring on the spindle center it is also possible to turn round work on this chuck. The maximum difference between major and minor axes of the ellipse which may be turned on this chuck is 3 in. In other words, the bullring may be thrown 1½ in. off center.

This chuck has some great advantages over the usual type of elliptic chuck as used on the ordinary engine lathe. First, the whole weight of the mechanism rests on the large faces of the guide ring and is constant, while the overhanging chuck throws its weight from side to side of the guiding lugs, as the chuck turns over, causing excessive wear. Second, the bullring carries none of the weight and serves simply to center the guide ring *E*. Third, bearing surfaces are ample and well lubricated. Fourth, the advantage of using the vertical turret lathe on classes of work where it is particularly useful.

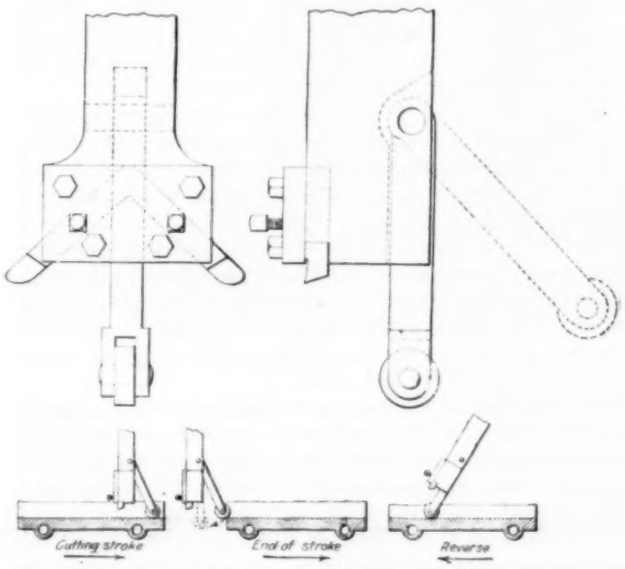
This chuck was designed in the engineering department of the Corning Glass Works and built by the Bullard Machine Tool Co.

Toolholder for Planing Crosshead Shoes

BY L. M. FRANCIS

In the article "Repairing Locomotives in a Machine-Tool Shop," on page 11, Vol. 59, of the *American Machinist*, there is illustrated the operation of planing crosshead shoes.

On a job the writer was recently connected with, the toolholder illustrated herewith was developed to facilitate planing of crosshead shoes and might be adapted to other similar work. The design resulted from finding that both sides of the shoes could not be finished at one time with an ordinary type of holder provided with two tools set at the desired width, due to there being no clearance, and resulting in the tools dragging on the return stroke.



TOOL FOR PLANING CROSSHEAD SHOES

As shown, the holder consists of a bar having two square holes at about 45 deg. to take two toolbits, and with setscrews provided to clamp the tools.

In the back of the bar a groove is cut to take the swinging arm shown, which hangs free on a pin at the upper end. The lower end of arm is provided with a roller, the purpose of which is easily seen.

In operation the arm trails behind the holder on the cutting stroke. At end of the cutting stroke the roller drops past the work so that on the return stroke the arm, which is now seated in the holder, lifts the tools clear of the work, allowing them to drop back to normal position at the end of the return stroke.

A Little Detail in Pattern Making

BY M. E. DUGGAN

A sketch of the pattern wanted—a four-sided affair with a rib through the center—is shown in Fig. 1, with the dimensions jotted down that the reader may know its size and weight. A clean casting was wanted; "clean inside and out," said the customer, "not in spots."

How would you make this pattern? Split through the middle on the line *XX* with side draft as indicated by the dotted lines, to be molded one-half in the cope and the other half in the drag?

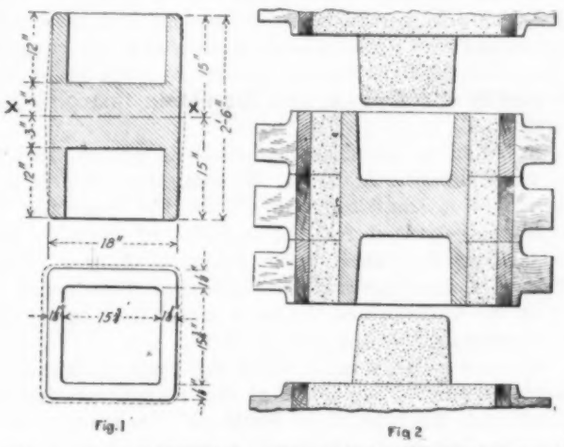


FIG. 1—THE PATTERN. FIG. 2—HOW THE PATTERN WAS MOLDED

"Nothing doing," says the old timer. "If it is molded in this way how am I to reach down into the cavities to mend, slick and black-wash the mold, as is necessary to produce a clean and smooth casting? I'll just change this method of molding," says the old boy, who had seen years of service in the foundry. "I'll use a cope, cheek, and drag, fasten the two halves of the pattern together and mold it in the cheek; lifting out the pocket sections of the mold with the cope and drag. This will leave all parts of the mold easily accessible."

This method, shown in Fig. 2, involves a bit more work for the molder, to be sure, but this is because the order calls for a "clean and smooth" casting. Don't give your hand a bad habit by writing "clean and smooth" on every order that goes to the foundry. This casting was to be buried in concrete six feet under ground, and the demand for a better than the common run of castings only resulted in increased cost to no purpose.

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors

October 18, 1923

Interest in Technical Research on the Increase

IT IS encouraging to note the recent revival of interest in technical research among the mechanical men of the country. The research committee of the American Society of Mechanical Engineers has existed for some years without much in the way of achievement to point to. The lack of results is undoubtedly due, in large measure, to scarcity of funds.

The funds for research can hardly be provided by engineers. Their job is to direct the expenditure of such funds to the best advantage. They are by nature good at doing things but quite the reverse as accumulators of this world's goods.

After all, the most immediate return made by successful technical research is to the business man who sells the improved product made possible by it. Eventually the consumer profits but hardly to such an extent as to justify a call upon him for aid in financing the research work.

We are glad to see, therefore, that at least a start is to be made by the A. S. M. E. committee which has appropriated a small sum to aid in the financing of some tests instituted for the purpose of revising the famous Lewis formula for the strength of gear teeth. A number of machine tool builders have volunteered to assist in the financing of the tests which may bring out facts of considerable interest to them.

As a result of this small start the topic of technical research became a live issue at the recent meeting of the National Machine Tool Builders' Association and a committee has been appointed to canvass the situation and report back as to what can and should be done by the association in technical research. We hope that their report may mark the beginning of a new era in machine tool design.

Is Your Production Man Popular?

IN TOO many cases the real function of the production man in a shop is not fully appreciated. Of course, it may be covered by saying that his job is to secure maximum production at minimum cost. But much depends on the interpretation of the definition.

There are many places where the production man is the embodiment of a slide rule, a stop watch and a pad of paper, all of which prepare the workers for a cut in piece rates. In such shops he is about as popular as the dog catcher in a shanty town. And it is safe to say that he does not secure maximum output at minimum costs. For, instead of being the best hated man in the shop the production man should be the most popular. Real production methods that secure maximum output should benefit everybody concerned.

Production methods which give the best results from every point of view, must take into consideration more than machine times and piece rates. Workers who believe that they are getting a square deal, who are so treated that they feel a real interest in the firm and its product, have more to do with securing maximum output than many realize.

The best production man is the one who can instill the spirit of confidence and co-operation in the working force. The personnel director cannot do it all—the production man can help more than he realizes, by cultivating tact and human sympathy. For while these may not directly affect suitable production rates, they have a distinct bearing on the way in which rates and schedules are applied.

The production man can do much to assure the men that they will get a square deal. And this is just as important in the long run as setting the proper production schedules.

Attracting Men to the Metal Working Industries

THE almost universal complaint from metal working industries that good men are hard to get ought to receive more thought and study than seems to be the case. It is a serious menace that demands careful consideration.

There seems to be little doubt that the changing conditions of the past decade have made the metal working industry seem less desirable than others to the kind of men which the industry needs. No matter how much we may believe that men are foolish in choosing other fields, the fact remains that they do and no amount of scolding is going to change the situation. The only solution is to study the case carefully, learn the reasons and find a remedy.

Having found the remedy we must make the young men see the advantages of the metal working industry. Mere advertising statements in glowing language will not answer. Good and sound reasons for working in the metal trades must be given and proved. There must be no camouflaging but plain statements of facts. Men have been overfed on propaganda and are very keen at detecting it under various guises.

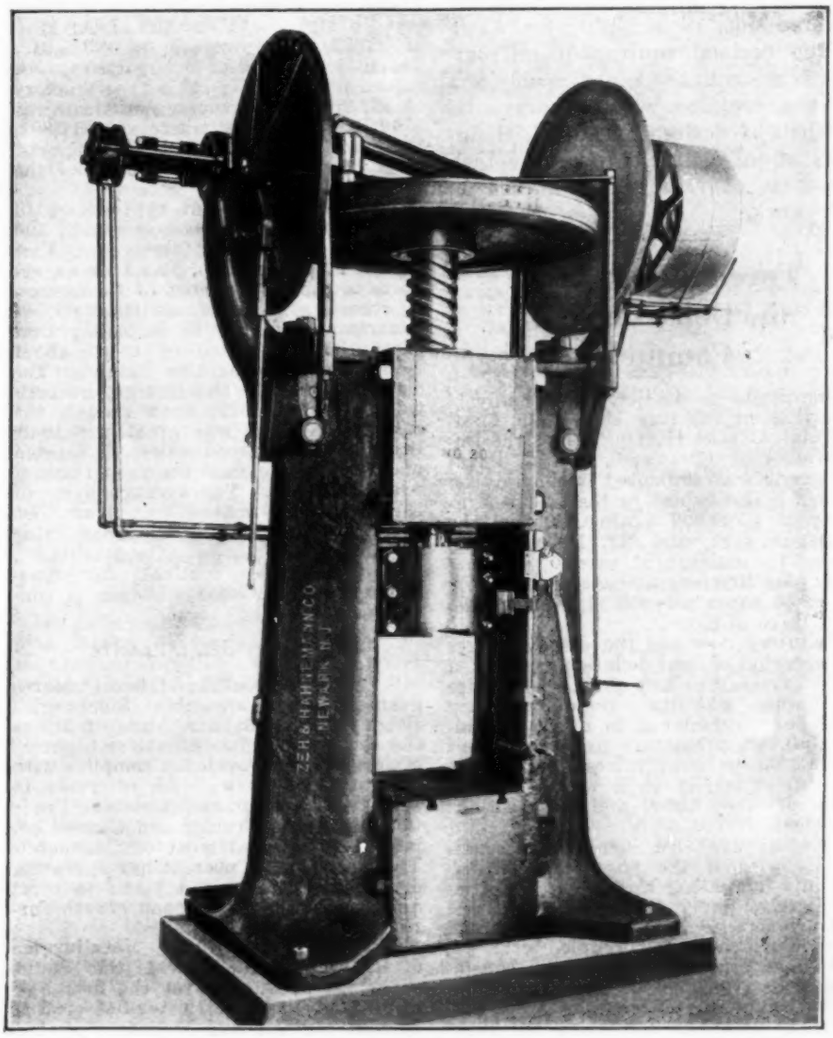
Among the conditions which men consider and criticise are those of wages, hours, working conditions, safety and opportunities of advancement. They do not see the advantages of serving a long apprenticeship to become skilled in various branches only to receive less money than a pieceworker with no special training. They do not understand why a bricklayer whose work requires far less skill than a good machinist, gets double his wages or more. The answer of steady employment does not satisfy as the bricklayer could earn as much per year by working half-time.

This question of attracting desirable men to the metal working industry is a real problem. The sooner it is given careful consideration the quicker will we find the answer. It is a problem which must be approached without prejudice and with an open mind.

Shop Equipment News

Zeh & Hahneman No. 20 Percussion Power Press

The Zeh & Hahneman Co., 182 Vanderpool St., Newark, N. J., has recently added a No. 20 to its line of percussion power presses, the machine being shown in the accompanying illustration. This press is designed to exert a pressure of 400 tons and is suitable for the heaviest class of hot or cold pressed work.



ZEH & HAHNEMAN NO. 20 PERCUSSION POWER PRESS

As will be noted from the illustration, the diehead is driven by means of a large screw, to the upper end of which a heavy flywheel is attached. This flywheel may be brought into contact with either of two friction disks, one for the downstroke and the other for the upstroke. The friction disks are mounted on a shaft which carries tight and loose pulleys for belt driving.

When the press is at the top of its stroke the flywheel is near the center of the friction disk and, when the two are put in contact by operating the press tripping mechanism, the flywheel is gradually accelerated. As the screw descends the flywheel increases its speed rapidly, since the driving radius of the friction disk increases, and energy is stored up. When the dies come together all this energy is available for doing work and is expended on the material between the dies as the flywheel is brought to rest.

The other friction disk then returns the screw to its original position, an automatic stop being provided at the top of the stroke. A brake insures prompt stoppage and holds the flywheel in neutral position. An emergency stop is also provided to prevent damage if the empty press is tripped, so that the flywheel will not strike the frame.

The main screw of this press is 11 in. in diam. and is made of special steel, heat-treated. The length of stroke is 20 in. and the distance between the diehead and the bed at the bottom of the stroke is 14 inches.

The driving pulleys are 36 in. in diam. with a face width of 8 in. and should run at 120 r.p.m. The area of the bed is 27 x 27 in. The press will make 12 strokes per min. and requires 20 hp. to operate. Its weight is 60,000 pounds.

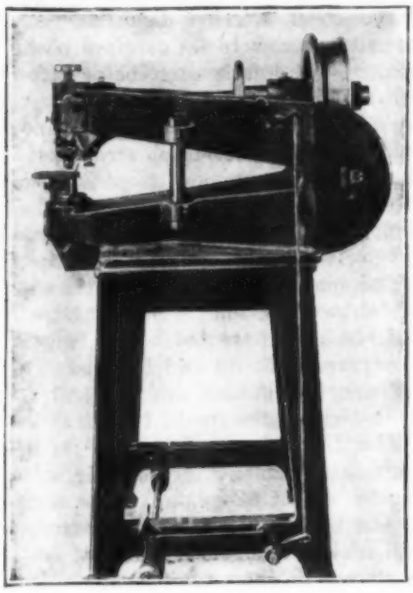
Campbell Nibbling Machines

Andrew C. Campbell, Inc., Bridgeport, Conn., has recently brought out two additional styles of "nibbling" machines for the rapid cutting of irregular outlines in sheet metal. The machines operate on the principle of a punch press, having a small piercing punch with a long pilot, which latter is never entirely withdrawn from the die after starting a cut and thus limits the amount of movement that can be given the sheet in any direction between strokes. Any desired shape may be cut out quickly by following scribed lines on the sheet or, in case of a number of duplicate pieces, a templet may be attached to the sheet to guide the punch.

The No. 1-B machine, shown in the accompanying illustration, is essentially the same as the original machine, described on page 597, Vol. 57, of the *American Machinist*, except that the throat is 24 in. deep,

enabling the machine to cut to the center of a sheet 48 in. wide if necessary. It will cut mild steel up to ⅛ in. in thickness.

The No. 2 machine has a depth of throat of but 12 in., but is much heavier in proportion and will cut mild steel plate up to a maximum of ¾ in. thick. It is especially applicable to the cutting of cam-blanks for automatic screw machines, and for roughing out profile and snap gages, and strippers that must be made of comparatively heavy material. Either



CAMPBELL NO. 1-B NIBBLING MACHINE

machine will cut an internal closed contour as readily as an external one.

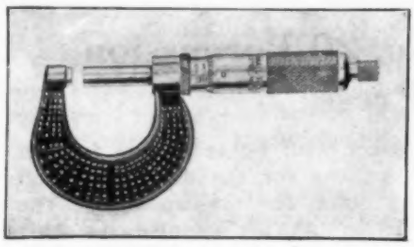
The No. 1-B machine occupies a floor space of 38 x 28 in., stands 55 in. high and weighs 770 pounds. It runs from 450 to 500 r.p.m. and requires a ½-hp. motor to drive it. The No. 2 machine covers a floor space of 33 x 19 in., stands 60 in. high and weighs 950 pounds. It runs at 300 r.p.m. and requires a 1-h.p. motor to cut the maximum thickness of ¾ inch.

Reed Improved Micrometer

The Reed Small Tool Works, Cherry & Vine Sts., Worcester, Mass., has recently improved its standard micrometer by the addition of decimal equivalents on the frame.

The feature of the tool as described on page 876, Vol. 47, of the *American Machinist* are retained, and include the deep-throated, concave form of frame, the two-part thimble, the stationary anvil and the rigid lock-joint.

After the frame is drop-forged and treated for special finish, the decimal equivalent figures are raised in finishing dies under high pressure. Decimal equivalents of eights, sixteenths and thirty-seconds oppear on



REED IMPROVED MICROMETER

one side with the sixty-fourths on the reverse side.

The decimal equivanent micrometer is made in the 1-in. size only and can be supplied with locknuts and ratchets if desired. The raised figures afford a firm grip of the tool, which is of value when in use on oily work.

Foreign News from the Department of Commerce

Industrial production in Germany is less than at any time since 1919, Commercial Attaché Herring cables the Department of Commerce. Total unemployment was estimated unofficially on Oct. 8 by an expert in the Labor Ministry at 1,200,000 against 800,000 the previous week, and Mr. Herring estimates the number of persons working only part time, 40 per cent of them only 24 to 33 hours a week, at between two and three millions.

Industry now has the disadvantages of a period of real deflation, without a gold currency or any prospect of price and wage stability. Sound currency and basic confidence to offset difficulties of this premature and too abrupt transition to gold prices continue to depend primarily on a workable solution of the Ruhr and Reparations problem.

The unparalleled increased expenditures, without the possibility of materially increasing the tax receipts immediately, imply the inability of the Government to finance the widespread unemployment in the occupied territory, which may prevail indefinitely, considering the transport demoralization and the complete uncertainty of the French intentions respecting the Ruhr industrial control.

The French blast furnaces are active, and some of them are several months behind in filling orders. Export orders for Lorraine pig iron are being received. The disposal through special comptoirs of the stocks seized in the Ruhr and the reselling to the Germans of a portion of the stocks not easily marketable in France, are being considered.

Exports from France in the first eight months of 1923 amounted to 14,900,000 tons, compared with 13,300,000 tons in the same period of 1922. Imports totaled 35,400,000 tons, compared with 33,100,000 tons in 1922. Among the 1923 imports are included 19,860,000 tons of coal, compared with 18,960,000 tons in 1922. The value of imports in the eight months of 1923 was 19,938,000,000 francs, compared with 14,606,000,000 francs in 1922, and the value of exports 19,128,000,000 francs, compared with 13,446,000,000 francs. For the month of August alone, imports amounted to 2,633,000,000 francs and exports to 2,543,000,000 francs, compared with 1,974,000,000 francs and 1,806,000,000 francs respectively, in August, 1922.

Tractors in Australia

Track laying tractors predominate among the types of tractors imported into Australia, according to a statement of the Australian Department of Trade and Customs. Imports of tractors during the 11 months ended May 31, 1923, were valued at £355,242. Tracklaying tractors imported were valued at £196,677; cable type tractors at £31,256; other types, not steam, at $109,415; and steam tractors at £17,892. Seventy per cent of these imports, amounting to £250,844 came from the United States.

The annual sales of typewriters in the Canary Islands have increased 100 per cent in the last four years, Vice Consul J. C. Greenup, Las Palmas, reports to the Department of Commerce. Of these at least four-fifths are of American make, which is to say that of the 3,000 typewriters in use about 2,400 are of American origin. The other 600 supply the foreign competition. But in 1922, even though the rate of exchange was greatly in their favor, the combined sales of foreign makes did not exceed the proportion of previous years. The average price of these foreign makes is about 500 pesetas, reckoning the exchange value of the peseta at about fifteen cents.

The immediate outlook for typewriters in the Canary Islands is considered good.

Brazilian Steel Plants

A recent Brazilian federal decree granted the Companhia Siderurgica Belgo Mineiro, Sabara, State of Minas Geraes, special concessions for a period of forty years provided it complies with certain federal laws with reference to subsidy of steel plants, Assistant Trade Commissioners Cremer and Connell report to the Department of Commerce. This company at present has operating one blast furnace and plans to erect another as well as an open hearth furnace and two rolling mills.

The Companhia Electro-Metallurgica of Ribeirao Preto, State of São Paulo, reports a production for the first half of 1923 of 1,382 metric tons of electric furnace pig iron and 2,561 tons of steel from bessemer converter and electric furnaces.

It is reported from both Rio de Janeiro and São Paulo that the iron and steel import market is quiet. Existing stocks at the end of August were low and buying for future deliveries from foreign sources light.

It is reported that from January to May, 1923, the Broken Hill Proprietary Co.'s steel works at Newcastle, N. S. W., produced 40,070 long tons of steel products including 27,691 tons of rails.

News Section

Dean Cooley Resigns as President of American Engineering Council

Resignation of Mortimer E. Cooley, dean of the College of Engineering and Architecture of the University of Michigan, as president of the American Engineering Council of the Federated American Engineering Societies was announced at the opening session of a two-day meeting of the Executive Board of the Council held in Rochester, N. Y., Oct. 12.

Dean Cooley, in presenting his resignation to the Board, said that he retires on account of ill health. He also made it known that he has been granted leave of absence by the University of Michigan for the second half of the academic year of 1923-1924 which commences in February.

Succeeding Herbert Hoover as president of the Federated American Engineering Societies, two years ago, Dean Cooley, now in his sixty-ninth year, has been identified with numerous national undertakings in the public service, notably the investigation into the two-shift system in continuous industry, and the study of coal storage now in progress throughout the country. During his term the federation has become the spokesman of the engineering profession of America in public affairs and foreign relations, in both of which fields extensive activity is at present being carried on.

The executive board, it was announced, would call for nominations for the presidency of the federation. Dean Cooley's successor will be formally chosen at the annual meeting of the American Engineering Council, executive organ of the federation, to be held in Washington, D. C., early in January.

The secretary's report reviewed the activities of the federation since the last meeting. The committee on public affairs presented a letter in which the discussion regarding the dismissal from the reclamation service of A. P. Davis by Secretary of Interior Work was taken up.

The patent committee asked permission to further investigate the needs of the patent office which was granted, no expenditure of money being involved. Various other committees also reported on the different phases of the work being done by the federation.

A resolution was introduced and passed appointing a special committee to draft and have introduced into Congress a bill calling for a reorganization of the Department of the Interior into a department of public works.

Ford Buys Johannson Gauge Co.

The Ford Motor Co., Detroit, has purchased the holdings of the Johannson Gauge Co., of Sweden with an American branch at Poughkeepsie, N. Y., according to dispatches from Detroit. The Johannson company makes precision instruments and gages and many of these are in use at automobile plants in all parts of the country as well as in other factories where precision is required. It could not be learned whether it is the intention of the Ford company to move the plant to Detroit or to still manufacture at Poughkeepsie.

Locomotives Are in Good Condition

Railroad locomotive equipment in the United States is now in the best condition for years, according to the American Railway Association. On Oct. 1 only 9,823 locomotives, or 15.3 per cent of the total number on line, were in need of repairs. This is the smallest percentage since records were kept by the American Railway Association.

On Oct. 1 the railroads had 54,159 serviceable locomotives, an increase of 892 since Sept. 15.

Howard E. Adt Dies Suddenly

Howard E. Adt, president of the Geometric Tool Co., New Haven, Conn., died suddenly Sunday evening, Oct. 14, at his home in that city. A complete obituary will be published next week.

Approve of Training for Apprentices

The following resolution was passed by the Board of Governors of the American Construction Council at the annual meeting held in New York City in September:

"With the desire of furthering a sound and adequate program on apprentice training for the construction industry and of co-operating in every way possible with the present bodies who are directing their efforts in this field, and who are or in the future may be, inaugurating and conducting agencies for such training, the Board of Governors of the American Construction Council hereby requests the officers of the Council operating especially through its committee on apprenticeship, vocational guidance, and craftsmanship, to co-operate with employees' and employers' organizations, building congresses, and all other elements in the construction industry, and with the educational bodies, local and national, in providing for apprenticeship which will be attractive to young men and will afford the fullest means for the employment and training of efficient workers as apprentices, and will produce the skilled workmen needed in the construction industry; and the Board further authorizes as the first essential step in this program the making of a national survey on apprenticeship nedes and conditions of labor supply throughout the construction industry through the appropriate agencies of the Council co-operating with all organizations within the industry."

Hoover Proposes Super-Power Plan for Eastern Territory

Promises of co-operation were given by the chairmen of Public Service Commissions of the New England and Middle Atlantic States to Secretary of Commerce Herbert Hoover at a joint meeting held Saturday Oct. 13 at the Engineering Societies Building, 25 West 39th St., New York City, for his plan of establishing a comprehensive super-power system covering eleven states and extending from Maine to the District of Columbia. The proposed development would cost approximately $1,250,000,000 and would mean the electrification of many miles of railroad systems, the building of new and more powerful central stations, a wider distribution from super-generators and extensive hydro-electric developments in all of the states included in the project.

The results from this program would be an annual saving of more than $500,000,000 and approximately 50,000,000 tons of coal to industries using electric power and when perfected a more satisfactory form of distribution of power. Another feature pointed out by Secretary Hoover would be the insurance against prolonged coal strikes or railroad difficulties.

The vast amount of work involved and the tons of new machinery and machine tools needed to undertake such a project would more than be compensated for by the economies which would result, it was shown, and the representatives of the various Public Service Commissions have pledged themselves to explaining fully the virtues of the proposition to the state legislative bodies upon their return.

Will Invite Industrialists

Another meeting, when it is expected representatives of industries will be present, will be called within a month or six weeks, it was announced.

The preliminary work to be done is to convince state legislators of the wisdom of the plan and arrange for the burden to be carried by each state involved to the satisfaction of all of the eleven. Little difficulty, however, is anticipated on either of these problems once the benefits are fully explained to those concerned.

South Is Optimistic Over Prospects For Machine Tool Trade

Regarded as a whole, machine tool sales in the Atlanta territory during the first ten days of October fell off to some extent as compared with the volume of business during the same period in September, though in individual cases the condition of business seems to have been unusually spotty. For instance, one of the largest dealers states his business the first ten days of this month has been very slack, while another large dealer expresses exactly an opposite view, stating that the volume has held up on a par with the good business enjoyed in September, with excellent promise for the rest of the month; a third large dealer states sales have been satisfactory, all things considered, but are slightly less than last month. Collectively, however, it is safe to assume that business in machine tools has been slightly off the first third of the month, as compared with the same period last month, but is somewhat better than it was during the dull Summer period—probably eight to ten per cent better. Conditions in the district right now are such as to indicate that October business will be close to the total maintained during September, and probably twelve to fourteen per cent above the sales during the Summer months of May, June, July and August.

Financially the section is in fine shape, with the foundry and machinery trades very active, though steel mills are reported slack. There has been marked improvement the past three weeks in textiles, with the industry operating in the South now on a better basis than at any time since the early part of the year; the lumber industries also are considerably more active than they have been, with most of the furniture factories and woodworking plants running at close to capacity. These industries, with the smaller machine shops, have been the principal buyers of machine tools in this section, and being more active now than they have been at any time since early this year, most dealers regard the outlook as exceptionally good.

Cotton continues to maintain a high price level at the principal markets, and this year's crop should sell for around $1,400,000,000, which is very much above the usual total for the South's principal commodity. So in spite of a slight decline the early part of this month, the trade is optimistic regarding the outlook for business during the rest of this year and the early part of 1924.

Slight Improvement in Chicago

Chicago dealers report a slight improvement in business this week. The Illinois Central R.R. has entered the market for the following: one motor-driven 2½-in. double bolt cutter complete with standard equipment; one 20-in. motor-driven upright high-speed drill with power feed; one 300-lb. helve-type power hammer suitable for general, medium and light blacksmith work; one 20-in.. x 10-ft. heavy duty engine lathe with taper attachment and with 16-in. 4-jaw independent steel chuck fitted, and with motor drive, including motor arranged for 40-volt, 50-cycle, three-phase, alternating current. The Chicago, Burlington & Quincy R.R. is seeking a Universal grinding machine. The Pullman Co. is in the market for a small lot of machine tools. The Illinois Steel Co. purchased tools last week. The Chesapeake & Ohio R.R. placed an order with the Industrial Works for six 150-ton self-propelling steam wrecking cranes. The Southern Pacific R.R. placed an order with the Shaw Electric Crane Co. for a 10-ton, 33-ft. span electric traveling crane. The Elgin, Joliet & Eastern ordered a planer and a boring mill.

USED MACHINERY

The used machinery market continues only fair. The Chicago market in both iron and steel is quiet, and railroad buying of standard steel rails featured an otherwise dull week in iron and steel. Chicago mills were awarded 26,000 tons of a total of 80,000 tons placed by the Baltimore & Ohio R.R. and the Chesapeake & Ohio R.R. It was estimated that up to this time railroads have placed orders for from 225,000 to 250,000 tons of rails for delivery in 1924.

Basing their calculations on the building permits being issued, material dealers are predicting a Fall and Winter season of unusual activity and most of them are putting stocks in storage to meet a continued heavy demand for all the more staple items. Structural steel demand continues active in the West with awards of the last week more numerous than in some time.

Much interest is shown in reports that railroads are about to enter the car market.

Business Improves in Cleveland

Improvement in the general industrial situation in the Cleveland district, since the first of October, has been noted in various angles. The machine tool status has had a reflection of this in more inquiries for equipment from manufacturing interests, but it is still too early to feel the influence in bona fide orders, so operators here are not too optimistic until they actually receive the anticipated orders.

The far seeing tool interests, however, are more interested in the economics of business, rather than the spotty condition that alternately raises and lowers hopes for better business. In this connection the labor movement is significant. During the last few weeks a paradox has occurred, in that wages have increased in industry as a whole while a certain amount of lay-off is seen in different plants. Briefly, one man in every two hundred has been laid off in Cleveland, while wages have increased an average of three cents an hour.

Steel manufacturers in Cleveland report that they probably will continue operating at the present rate for the rest of the Fall season. This attitude is sponsored by the revival of buying of semi-finished materials by the railroads, and a revival of general industrial need after the Summer dullness. Among those mills specializing in sheet products, new furnaces have been started, and others are expected to open up soon. In tin plate practically the entire output of the mills of this district has been sold, and consumers are beginning to place their business for the first half of 1924. Of those mills producing heavy duty material in this district that are not operating to capacity, they are working at not less than 75 per cent of their output, executives report. And of the twelve blast furnaces in Cleveland, ten are operating.

Of course individual orders from consumers in this division are small, but the aggregate volume is surprisingly heavy at the end of the fortnight or month, operators assert.

Skilled Men Scarce in Philadelphia

Machine tool shops are operating from 60 to 70 per cent of normal conditions, in the Philadelphia district. Railroad companies which were rather heavy purchasers a month or so ago, have apparently bought up to their requirements and replacements are not great. One of the largest manufacturers in Philadelphia said a reduction in his force may be necessary.

Automobile manufacturers are the best purchasers at this time. The future is uncertain, but hopes of some manufacturers for an increase in orders may be justified within a few weeks, it was reported.

Dealers in machinery of all kinds report sales of smaller volume this week. Practically all of the demand is limited to replacement and repairs to existing equipment.

In the woodworking machinery line there is reported a shortage of skilled workers. Car building plants report the need of additional men. A large automobile body building company, which is making additions to its force, is in need of bench hands, die makers, jig and fixture men.

The State employment office in Philadelphia reports a demand for millwrights, belt repairmen and stationery engineers in several places in the state. Electricians and maintenance men also have been called for.

The Remington-Burnelli Aircraft Corp. of New York, plans to erect a plant in Philadelphia, according to an announcement this week. A four-acre tract has been acquired in the Southeastern section of the city.

New York Market Is Quiet

Single tools and a few special tools of the heavier type are the only sales reported in the New York district this week. Railroad buying has been slight and general industrials are buying only small machines for immediate needs. The Pennsylvania R.R. and the Southern Pacific R.R. both have lists out in the New York district and sales are expected in both cases within the next few weeks.

Buying by automotive houses in the East has not been heavy during the

past week, but there has been some activity and much more is anticipated within the next month. Automobile production has been improved within the last month and dealers state that requirements will force the automotive men into the market before December.

There has been a good market for used tools during the past week, but dealers report that it has been difficult to pick up anything in good condition lately. A receiver's sale has been announced in Rochester for the Davis Machine Tool Co. and from a perusal of the list sent out a wide variety of tools will be offered.

Business with Japan has not as yet developed beyond necessary road making and building machinery such as concrete mixers, small hoists and rock crushers. But every Japanese export and import house in New York is of the opinion that business will develop within from two to three months and the demand will be heavy at that time. Catalogs have been requested and partial lists of the probable requirements have been received by some of the representatives. Other exporting business has been fair during the week with no especial activity featured.

Improvement Noted in Cincinnati

The machine tool houses in Cincinnati have shown evidence of increasing activity during the past two weeks, although business at best can only be said to be fair. The decrease in production and orders which affected the local market rather seriously in the last month has brought about curtailed operation in many of the Cincinnati plants, but signs of improvement in the coming weeks are apparent in the number of inquiries which are being received and which should develop into actual business before long. Production of lathes has been stimulated in several local factories by orders placed recently by railroads. Railroad inquiries in general are somewhat slow at present and only necessary purchases are being made. Several large machine tool plants state that there has been a number of inquiries received from the automobile manufacturing industry, this being an indication that the manufacturers in the Detroit district will place some business within the next month or so. Orders for lathes and other machinery have been coming in from various sources and no particular industry has been contributing more than its share of business.

Electrical Tools Active

An encouraging feature of the local situation is the amount of business being done by the electrical tool houses. Several of the large manufacturers of electric drills and grinders say that their production has been holding up well for the past few months. The last week of September and the early days of October witnessed a reduction in the volume of business of the electrical tool companies, but officials believe that this period of reduced orders is merely temporary. They are firmly of the belief that the rest of the year will bring a normal amount of business.

Conveying machinery concerns have been experiencing a good season and orders are holding up to a good standard. Here again the outlook is very encouraging and manufacturers of conveying machinery think that the next three months should be prosperous. Both orders and inquiries are sufficiently numerous to indicate a healthy condition in the conveying machinery field.

A fair amount of activity features the used machinery trade. Although the volume of sales on used machinery has not held up to that of 1922 at this time of the year, the outlook is for increased sales during the rest of October and the several months to follow.

The outlook for the immediate future in the machine tool houses of Cincinnati is decidedly uncertain. From present indications the best that can be expected during the coming weeks is a fair amount of business.

Vermont Engineers Propose "Green Mountain Section" of A.S.M.E.

The joint meeting of the Vermont Society of Engineers and the local membership of the American Society of Mechanical Engineers which was held at mechanically historic Windsor, Vt., on Friday and Saturday, Oct. 5 and 6, was successful beyond expectations. Inspection trips were made through the machine tool plants of the National Acme Co. and the Cone Automatic Machine Co.

The meeting formally opened with a dinner at the Windsor House at 6:30 p.m. on Friday, at which about sixty society members and guests were present. The business meeting following the dinner was opened by C. A. Slayton of Morrisville, president of the Vermont Society of Engineers, with a short and vigorous speech.

President Slayton introduced Edward Robinson, professor of Mechanical Engineering at the University of Vermont who explained clearly the proposed plan of affiliation between the Vermont Society of Engineers, which is a local society with about two hundred and fifty members, and the American Society of Mechanical Engineers which is a national organization having over 18,000 members. Professor Robinson sketched out the advantages of such an affiliation, and then introduced Charles Penrose of Philadelphia, past president of the Philadelphia Section of the A.S.M.E., the largest section in the United States.

Guy Hubbard Presents Petition

A form of petition to the A. S. M. E. for the recognition of a local section covering Vermont and eastern New Hampshire was then read by Guy Hubbard of Windsor. This was favorably received and was immediately signed by all the A.S.M.E. members present. After considerable discussion the name "Green Mountain Section" was chosen as most suitable for the proposed new branch.

The officers of this proposed Green Mountain Section are: Chairman, Professor Edward Robinson of the University of Vermont; vice-chairman, Guy Hubbard of the Engineering Department of the National Acme Co.; secretary and treasurer, Daniel H. Parker, office manager of the National Acme Co.; executive committee for two years, Joseph B. Johnson of the Jones & Lamson Co.; executive committee for one year, Frederick Holdsworth, mechanical engineer of the Sullivan Machinery Co.

Upon the conclusion of this business meeting, the gathering moved to the Namco Club, where the guest of honor of the evening was introduced by Professor Robinson. This gentleman was Dean Dexter S. Kimball, head of the Engineering Schools of Cornell University, past president of the American Society of Mechanical Engineers, and an author and lecturer of note upon matters mechanical. Dean Kimball delivered an illustrated lecture on "The Effect of the Machine Tool Industry Upon Civilization."

Detroit Expects Record Automotive Output in Last Quarter

An unexpected increase in orders for closed cars which Detroit automobile plants were hardly in a position to anticipate was the outstanding development of the past week in this automotive center.

Not only has the closed car show in progress eight days helped in making this demand, but a nation-wide realization that the closed car type is the best for all-year service has convinced motor executives here that their plans for increasing production of closed car types are not in error.

Machine tools appear to be finding a better market than in some little time, according to all advices. The speeding of additions to factories is creating a larger demand for machinery of all kinds.

Symposiums of the business outlook for the automobile industry in the Fall and Winter as they have appeared in the press show a wide-spread optimism pervading executives, managers and salesmen. All production figures for a month were broken in September by some of the plants, while practically every manufacturer is preparing for record figures for the last three months of the year.

Building construction continues to set a high record, and Detroit this year will exceed its former high mark by several millions. Banks report a healthy condition in industry. The city's credit was further shown with the issuance of a new $2,000,000 loan during the week to the city.

Hearings will be resumed Oct. 15 before the Interstate Commerce Commission and the Michigan Public Utilities Commission on the proposed increase in switching charges on the Michigan Central Railroad. The Detroit Board of Commerce, the Michigan Manufacturers' Association and the Milwaukee Junction Manufacturers' Association are uniting in opposing the charges.

Employment decreased slightly during the week, falling from 214,590 to 214,071, a decline of 519 in those firms of the Employers' Association.

Car loadings for the week showed material increase, and all railroads report a large volume of business.

Business Items

The Maryland Bolt & Nut Co. has been organized to operate the plant formerly operated by the Maryland Bolt & Forge Co., Mount Washington, Baltimore. S. Forry Laucks, president of the York Safe & Lock Co., York, Pa., is president of the new company. Linus Keating, president of the Harrison Bolt & Nut Co., Harrison, N. J., is vice-president and treasurer. Additional machinery is being installed.

The Sacramento Engineering & Machine Works, a new concern headed by L. C. Brosemer, former superintendent of the Stockton Iron Works, will commence operations shortly in the plant formerly occupied by the Big Four Truck Co. in Riverside Road, Sacramento, Calif.

The Mond Nickel Co., Ltd., of London, Eng., has purchased the minority stock previously held by Charles T. Hennig and G. P. Bassett, Jr., and is now the sole owner of the American Nickel Corp., Clearfield, Pa.

For the fiscal year ending July 31, the Ford Motor Co. of Canada, reports profits of $5,106,197 which is an increase of two per cent over the $5,006,521, of profits for the preceding year, though the figures fall somewhat short of the estimates by some of those who have been watching the company's progress.

The Link-Belt Co., Chicago, has purchased the Meese & Gottfried Co., San Francisco, Los Angeles, Seattle (Wash.) and Portland, Ore. The new organization will be known as the Link-Belt Meese & Gottfried Co. and its headquarters will be in San Francisco.

The Charles W. Fish Lumber Co., Elcho, Wis., is buying a round lot of sawmill equipment in the Chicago market for a $100,000, mill and woodworking factory replacement occasioned by the partial destruction of the plant by fire late in September.

Officials of the Florida East Coast Railroad Co. have announced that the company is planning the establishment of a large terminal and shops at Bowden, Fla., probably during the next year, an investment of approximately $1,500,000 being planned. The announcement emanates from the company's offices at Jacksonville, Fla.

A petition of Harry G. Fisk and Frank H. Shaw, receivers for Stevens-Duryea, Inc., for authority to sell the company's plant and assets for $450,000 to a group composed of Ray M. Owen of New York City and others has been granted by the Superior Court at Springfield, Mass. It is stated that the sale will be carried through promptly and that Owen, who formerly built the Owen Magnetic car, will continue to build the Stevens-Duryea automobile at the plant. The present Stevens-Duryea plant, built in 1920 at Chicopee Falls, Mass., to replace the plant sold by the original company to the Westinghouse Electric & Manufacturing Co. for the manufacture of guns for war use, cost about $1,000,000. The concern went into the hands of receivers in May, 1922, since which time it has been operated by the receivers on a limited scale. When fully equipped the plant has a capacity of from 1,500 to 2,000 cars a year.

Federal Judge John M. Hazel has signed an order authorizing the receivers in equity to issue certificates for $50,000 to continue the operation of the Silzer Steel Corp., Buffalo and Syracuse, until Dec. 31. John G. Dillon of Buffalo was named as co-receiver at the request of stockholders, creditors and the receivers, C. B. Porter, formerly president of the corporation, and S. F. Hancock.

Obituary

RALPH PETERS, president of the Long Island R.R. since April 5, 1905, died suddenly at his home in Garden City, L. I., recently of a heart weakness that unexpectedly developed. Death occurred before the arrival of a physician. A few days ago he caught a cold, which, however, is not thought to have influenced seriously his condition. For a year or more his health had been failing and he had been gradually lessening his activities. On the nineteenth of next month he would have been 70 years old, and thus automatically retired by a rule of the Pennsylvania system.

ROBERT KERR, president of the Kerr Engine Co., Windsor, Ontario, Can., died recently at his home in Walkerville, Ontario.

Personals

E. C. MORSE has joined the organizations of the Triumph Electric Co., and the Triumph Ice Machine Co., Cincinnati, Ohio, as vice-president in charge of sales and as a member of the board of directors.

GENERAL GUY TRIPP, chairman of the board of directors of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., and LOYALL A. OSBORNE, president of the Westinghouse International Co., sailed for Japan Oct. 10 on the S.S. Shinyo Muru in response to urgent cablegrams from the stricken areas of that country.

N. H. NORRIS, works manager for the Renfrew Machinery Co. of Renfrew, Ontario, for seven and a half years, is shortly to leave Renfrew and go into another line of business.

HENRY DRESES, formerly president of the Dreses Machine Tool Co., Cincinnati, Ohio, returned Oct. 9 from a trip to Europe.

BRIGADIER GENERAL SMEDLEY D. BUTLER, of the United States Marine Corps, will resign soon as commandant of the Marine Post at Quantico, Va., to become associated with the Packard Motor Car Co. in Detroit in an executive capacity.

WILLIAM G. STEBBINS, purchasing agent and employment manager for the Millers' Falls Tool Co., Millers' Falls, Mass., has been given a gold watch by the board of directors in honor of his completion of 50 years' service for the company.

WALTER V. HOUCK has been appointed sales engineer for Crane-Schiefer-Owens, Inc., Buffalo, N. Y.

NEWMAN M. MARSILIUS has been appointed works manager of the Bilton Machine Tool Co., Bridgeport, Conn.

A. W. GREGG has been appointed foundry superintendent of the Bucyrus Co., South Milwaukee, Wis. He was formerly foundry superintendent of the Whiting Corp., Harvey, Ill.

RICHARD W. YERKES, formerly general manager of the Link-Belt Co., Chicago, at the Philadelphia plant, has been appointed treasurer of the Link-Belt Co., succeeding B. A. Gayman.

FRANK R. TAYLOR, formerly with the Addressograph Co., has joined the sales organization in Chicago of the Stocker-Rumely-Wachs Co.

B. A. GAYMAN, formerly treasurer of the Link-Belt Co., Chicago, has been selected to head the Link-Belt Meese & Gottfried Co., San Francisco.

JAMES L. GOUGH has been appointed sales manager of the Stocker-Rumely-Wachs Co., Chicago.

L. WECHSLAR has taken over the supervision of the New York office of the Canton Foundry & Machine Co., Canton, Ohio. His headquarters are at 203 East 15th St.

E. C. KIRK has been named sales representative in West Virginia for the United American Metals Corp., Brooklyn.

MR. BERGERE has been appointed in charge of the New England district for the Canton Foundry & Machine Co., Canton, Ohio, with headquarters at 261 Broadway, New York City.

HARRY S. STERNBERG has been appointed sales manager with charge of distribution by the Blakely Manufacturing Co., Detroit, Mich. Mr. Sternberg has been with the Signal Motor Truck Co. for the past four years in charge of the engineering, production, purchasing and service with title of vice-president.

CHARLES A. GOODSPEED will continue as factory manager in charge of manufacturing at the Blakely Manufacturing Co., Detroit, Mich.

EDWARD J. SCHRIEVER, for the last four years secretary of the Pollak Steel Co., Cincinnati, Ohio, has submitted his resignation. Mr. Schriever will engage in the real estate business in Cincinnati. Prior to becoming secretary to the Pollak company, Mr. Schriever was general auditor of the company a number of years.

J. P. OLIVEAU, formerly mechanical engineer for Mercer Motors, Trenton, N. J., has opened an office in Cleveland for the design and development of special machinery.

Southern Exports Show Increase

Export trade in iron products, machinery and machine tools in the past few months has been quite active, with some improvement noted in shipments out of Southeastern ports during the past four or five weeks as compared with Summer volume. Considerable shipments of machinery have been made to the sugar industries of Cuba, with fairly good trade in Latin-America. The outlook is for one of the largest exports years for the metal trades industries of the South.

Steel Treaters Convene in Steel City

"On to Pittsburgh," the slogan for the fifth annual convention of the American Society for Steel Treating, seemed to hit everybody just right. They were all there, more than 1,600 strong, and how they managed to squeeze into the hotels will always remain a mystery.

With the hotel question settled some way or other, there were only two things to worry about—the business side of the convention and the pleasure side. Smoker, dance and banquet were more than well-attended, the first-named producing several high spots that indicated how well the steel-treaters realize the value of play. Governor Pinchot, of Pennsylvania, spoke at the banquet. Emmanuel J. Jenitzky, metallurgical engineer of the Illinois Steel Co., was presented with the Howe medal for the best technical paper on steel treating during the past year.

Plant visits were accorded the usual popularity given them in Pittsburgh, a city that need not feel at all bashful about what it has to show. The scheduled trips were to the plants of the Westinghouse Electric & Manufacturing Co., the Carnegie Steel Co. (Homestead Works), and the National Tube Works.

Exposition Well Attended

In the International Steel Exposition, which has become a recognized part of the convention, approximately 150 exhibitors took part. It is estimated that nearly 50,000 people visited the exhibitions in Motor Square Garden during the five days. Many types of machines, devices and apparatus were shown, including welding apparatus; gas, oil and electric furnaces; furnace materials and accessories; machine tools and other machinery; steels; instruments; chemicals and heat-treating compounds; testing apparatus and machines; cutters, drills and other small tools; gages; balls and ball bearings; oils. About 50,000 square feet of exhibit space were used.

Many Excellent Papers

Technical sessions were arranged to interfere as little as possible with the exhibit, a practice to be highly recommended. Of the many good papers only a few can be mentioned: "The Tempering of Tool Steels," by J. P. Gill and L. D. Bowman of the Vanadium Alloys Steel Co., Latrobe, Pa.; "Case Hardening and Other Heat Treatments as Applied to Gray Cast Iron," by H. B. Knowlton, Instructor, Central Continuation School, Milwaukee, Wis.; "Effect of Heat Treatment on Lathe Tool Performance and Some Other Properties of High-Speed Steels," by H. J. French, Physicist, Bureau of Standards, Jerome Strauss, Materials Engineer, U. S. Naval Gun Factory, Washington, and T. G. Digges, Assistant Physicist, Bureau of Standards; "Testing of Steel for Hardness," by H. M. German, Metallurgist, Henry Disston & Sons, Inc., Philadelphia; and "Salt Baths and Containers," by Sam Tour, Metallurgist, the Doehler Die Castings Co., Brooklyn, N. Y. The papers are being printed in the *Transactions* of the society and some of them will be abstracted in the *American Machinist*.

Officers elected for the ensuing year are: President, George K. Burgess, director of the United States Bureau of Standards at Washington; vice-president, R. M. Bird of the Bethlehem Steel Co.; treasurer, Zay Jefferies of the Aluminum Co. of America, of Cleveland; director, J. F. Harper of the Allis-Chalmers Co., of Cleveland; and secretary, W. H. Eisenman, of Cleveland.

The city for the next annual meeting will be selected and announced within a few weeks.

Industrial Specialists Needed Abroad

Industry is becoming convinced more and more, judging from communications reaching Washington, that commodity specialists should be employed abroad to a greater extent than is the case at present. With a very few exceptions, the Government's representatives abroad, who deal with industrial matters, are expected to report on all commodities and all lines of endeavor in which this country is interested. While there is no expression of feeling that the maintenance of such men is not more than justified by the value of material which they submit, the need for specialists, particularly in those countries offering promising markets for machinery, chemicals, and electrical equipment nevertheless exists. Specialized knowledge of these lines is almost essential to a comprehensive analysis of the trade possibilities.

There is reason to think that Congress will consider, at the forthcoming session, the granting of an appropriation for a limited experiment along those lines.

Car Loading Record Again Broken

Car loadings of 1,097,274 for the week ended Sept. 29, reported by the American Railway Association, were the largest in the history of the railroads. The previous high record of 1,092,567 was made in the last week of August this year. The merchandise and miscellaneous loadings of 646,185 cars were 21,425 more than the previous week, and an increase of 65,380 cars over the same week of last year.

Increases were shown in the loadings of coal, forest products and grain, while decreases were registered in ore, live stock and coke.

The high record for 1922 was made in the week of Oct. 28, when 1,014,480 cars were loaded. The high record for all time previous to this year was made in the week of Oct. 14, 1920, when 1,018,539 cars were loaded.

New Freight Station Opens in Detroit

On Oct. 15 the Pennsylvania R.R. opened its new Detroit freight station and team tracks located on Third St. between Congress and Larned Sts. Unexcelled service will be installed for the handling of less than carload and carload freight to and from all points reached by the Pennsylvania R.R. and its connections.

These facilities include the most modern and best equipped freight house in Detroit. The tracks serving the freight house enter the second floor. Freight is handled between the track level and street level by five automatic electric elevators of 10,000 lb. capacity each. The ground floor being entirely free from tracks is exceptionally well adapted for the prompt handling of freight between any point on the floor and the trucks at the doorways.

Improved Service

With the opening of the freight station there will be inaugurated through package cars moving in fast freight service between Detroit and the principal cities and freight transfer points on the Pennsylvania system.

Adjacent to the freight station are six team tracks having a capacity of 102 cars served by concrete driveways entered from Third St. In addition to the team tracks at Third St. there are team tracks having a capacity of 100 cars of similar construction at West Fort and Summit Sts. At Summit St. there is a 25 ton crane, making the Pennsylvania the only railroad in the city with this facility.

Will Help Welding Instructors

The Gas Products Association, with headquarters at 140 S. Dearborn St., Chicago, recently appointed an educational committee to co-operate with trade and technical schools all over the country in supplying a practical and standard course in welding procedure. The users of oxy-acetylene welding equipment have never been thoroughly satisfied with the work done by welding school graduates, and at the same time the application for the welding processes has been extended to so many new fields that the demand for skilled operators is constantly increasing. It is thought that by making a thorough investigation of the needs of the industry and then making recommendations to welding school instructors, the instruction programs can be revised and standardized so as to more fully meet the requirements of the employers. The plan has been already submitted to some schools and has met with their enthusiastic response, so it is felt that the instructors are honestly desirous of giving the students such training as will guarantee them the very best earning power.

Fred R. Low Is Elected A.S.M.E. President

As a result of the recent election of the American Society of Mechanical Engineers, the following were chosen for offices: Fred R. Low, New York, president; H. Birchard Taylor, Philadelphia, George I. Rockwood, Worcester, Mass., and W. J. Sando, Milwaukee, vice-presidents; E. O. Eastwood, Seattle, E. R. Fish, St. Louis, and F. A. Scott, managers; William H. Wiley, treasurer. The delegates to the American Engineering Council will be: F. K. Copeland, Chicago, J. T. Faig, Cincinnati, R. E. Flanders, Springfield, Vt., Dexter S. Kimball, Ithaca, N. Y., W. B. Powell, Buffalo, William Schwanhausser, New York, S. W. Stratton, Cambridge, Mass., C. C. Thomas, Los Angeles, and P. F. Walker, Lawrence, Kan.

The Industrial Review

Japan entering automotive and electrical markets with machine tool catalogs requested—Bus transportation becoming important source of orders

FROM different parts of the country come different reports as to business conditions in the machine tool industry. Detroit reports normal automotive production resumed, while New York holds out hopes that the long expected business will actually commence during October. Taken together, however, October is proving to be an average month, better in most respects than any month since May and with brighter prospects than the other months of 1923. "Good but spotty," characterizes the recent reports from St. Louis, Indianapolis, Chicago, and Philadelphia, wnile Cincinnati, Milwaukee and New England all report production fairly active, but sales below normal. Since Oct. 1, Buffalo machine tool business has improved to a considerable extent.

The disaster in Japan was looked upon at first as an opportunity for the United States to sell the stricken country much material for rebuilding. Later it seemed as if lumber and steel would be the only requirements for some time to come. Machine tool manufacturers did not see any sales prospects for at least six months as housing facilities were needed more urgently.

But now the Japanese situation has taken another turn and the machine tool people find themselves indirectly benefited through the purchasing of other necessities for the devastated area. Motor trucks and light automobiles are in demand in both Tokio and Yokohama, thereby giving impetus to the machine tool industry. Makers of heavy electrical machinery have recently received two large orders, one for a million dollars and another for three-quarters of a million which will also help the machine tool builder indirectly. Electric railways are reported as needed in the two cities visited by the earthquake, again bringing into demand machine tools. The orders for structural steel from Japan have thus far been disappointing and not up to the amounts expected.

Japan Buying

Japanese interests have been inquiring in this country for textile machinery, cement mixing machinery (an order was placed for 27 cement mixers recently) and road building machinery. Machine tools used either by American companies or Americanized companies in Japan will not be in demand for some months yet, according to the general opinion, so that builders will have to be content with the indirect outlet for their products.

That machine tools will be purchased to replace those that were destroyed by either the earthquake or the resultant fire is evidenced by the fact that exporters to that country are requesting all sorts of machine tool catalogs. Mitsui & Co., American Express Building, New York City, has sent out a request to all machine tool builders for their latest catalogs and price lists and other well-known Japanese firms will undoubtedly do the same.

In the Electrical Field

Better business is reported from the electric lamp manufacturers and there have been several improvements made in the manufacture of lamps that may call for new machinery, it is stated. Expansion work is going on at the Hawthorne works of the Western Electric Co. in Chicago, and in other parts of the country come reports of minor expansions which show the electrical industry generally to be in a healthy condition. The Packard Electric Co., Warren, Ohio, is issuing bonds for a big expansion program that it has contemplated.

Another good indication of the improvement in the electrical business is the report of the Westinghouse Electric & Manufacturing Co. which shows a 28 per cent gain during the first half of its fiscal year that started April 1. Most of this increase is credited to the small lines of equipment that the company makes.

Other important manufacturers of electrical goods also report that business is in excellent shape and that further improvement is looked for during the last two months of the year, bringing the year's totals up to records in their respective histories.

Electric Railways

Electric railways are reported as being steady and here and there throughout the country expansion programs are rumored. However, two recommendations recently made would indicate that there is every chance of increases in railway lines within the next few months. Daniel L. Turner, engineer for the New York State Transit Commission, recommended the construction of a system through Queens County, New York, at a cost of $100,000,000 and it is understood that the commission is favorably inclined toward such a program. In Los Angeles, engineers have submitted plans to the city council for a proposed subway and here, too, favorable action is expected.

Bus Transportation

But on the other hand, at Everett, Wash., the street car company has abandoned most of its lines and installed buses in place of street cars. This was a good move for the machine tool builders as in each case car barns and electrical railway repair shops had to be converted into automotive repair shops of an extensive nature. In fact, bus lines are being operated in many parts of the country by railway companies. During the last year the number of buses owned by traction companies nearly doubled.

Industrial Building

Building figures are exceptionally favorable at the present time. During September contracts awarded on large engineering construction projects reached $173,072,000 as compared with $141,599,000 in August and $138,648,000 in September, 1922. One power plant to be constructed at Florence, Ala., will cost $3,472,487.

Mines Expanding

In the mining districts of the country things are going along in a rather even and satisfactory manner. Expansions are noted in the Coeur d'Alene region, and in the Butte and Anaconda regions the mines are re-opening. The Calumet & Arizona Mining Co. is installing three new pumps of the Prescott type geared to Westinghouse motors. A new crushing plant will be built at Mayer, Ariz. The Central Copper Co. in Arizona is to install a milling plant, power house and tramway and from other parts of the country improvements are noted.

The production of bituminous coal has declined in almost an equal ratio to the price drops of the last few weeks. Demand is slight and stocks seem to be ample for the present in most manufacturing districts. However, both the anthracite and the bituminous mines are in the market for new equipment and it is understood that lists have been sent out by some of the larger operating companies on important machinery for delivery within the next 60 to 90 days.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0337	$0.0337	$0.0292
Cold finished shafting	per lb.	0.0433	0.0433	0.0378
Brass rods	per lb.	0.165	0.17	0.171
Solder (½ and ½)	per lb.	0.262	0.276	0.2283
Cotton waste	per lb.	0.1225	0.1225	0.1458
Washers, cast iron (½ in.)	per 100 lb.	4.66	4.66	4.33
Emery, disks, cloth, No. 1, 6 in. dia	per 100	3.08	3.08	2.96
Lard cutting oil	per gal.	0.575	0.575	0.575
Machine oil	per gal.	0.349	0.349	0.36
Belting, leather, medium	off list	37%	37%	44½%
Machine bolts up to 1x30 in.	off list	49½%	49½%	49%

Steel Production in September

The American Iron and Steel Institute recently issued its report of steel ingot production for September, placing it at 3,313,354 tons, a daily average production by all companies of 132,534 tons. This compares with total production in August of 3,677,771 tons, or 136,214 tons daily production.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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THE propaganda of prosperity originating at Washington and the strength of the grain markets were the outstanding features of the business news last week. A White House statement is quoted as indicating that "the President was very optimistic over the general business outlook." It was added that while he did not consider himself a prophet he was constantly in receipt of reports that led him to believe that business was good throughout the country except in Oklahoma, where some depression is felt as a result of the excessive production of oil on the West coast, and certain districts in the wheat belt where a crop failure and low prices had caused some distress.

The President's hopeful attitude was endorsed by Secretary Hoover, who expressed himself as taking a very optimistic view of the situation, as well as by Secretary Mellon, who is quoted as believing that too much pessimism exists, particularly in Wall Street, over the business situation.

As bearing upon the price of wheat, the President let it be known that he was much encouraged by the efforts that the War Finance corporation is making to assist the farmers and that he had asked ex-Governor Lowden to take the chairmanship of a committee to aid in stimulating the organization of wheat producers.

Some facetious observers assert that in making this appointment the President has found a new way of "passing the buck" of the farmers' dissatisfaction on to a political rival, as in the case of Governor Pinchot. But if any strategy of this sort was intended the grain markets may confute it, for wheat has advanced to $1.14 for May delivery and corn is strong and higher at over a dollar for the cash article and 77 cents for December delivery. The advance in corn is the more remarkable in that it has followed the issuance of a government report indicating a crop of over 3,000,000,000 bushels, which will be the fourth largest in the history of the country.

The cotton market has also been somewhat paradoxical, for it has advanced notwithstanding the shut downs reported from New England. These shut downs are, however, in part explained by the state wide referendum that is to be held in Maine on Monday to determine whether the present 54-hour week shall be superseded by the 48-hour week as the legal minimum in the textile industry. The cotton manufacturers of New England are naturally opposed to a curtailment in the hours of labor, and their ostentatious pessimism is partially explained by their fear that the adoption of a 48-hour week in Maine would probably be followed by the enactment of similar legislation in Rhode Island and New Hampshire.

In the South the cotton mills are running at their full capacity and the dry goods markets are generally satisfactory, although their tone is perhaps a little subnormal as a result of the somewhat gloomy reports that emanate from New England.

In nearly all of its other aspects the outlook seems to be satisfactory. The car loadings for the week ended Sept. 29 show a new record for all time. The Federal Reserve Banks report a satisfactory trade turnover. Bidding at the fur auction held in St. Louis last week is described as spirited, with prices well above those of last year.

"The President's optimism is endorsed by Secretary Hoover, who expressed himself as taking a very optimistic view of the situation, as well as by Secretary Mellon, who is quoted as believing that too much pessimism exists, particularly in Wall Street, over the business situation.....It is, however, evident that the condition of private business in Europe, Great Britain alone excepted, is better than most Americans, have been led to believe. .....The investment demand for bonds and high class securities not actively traded in on the exchange is already improving."

A better demand in the steel industry is admitted. It is said to be due to larger orders from the railroads. Sugar and coffee have been steady at the advance in prices recently established, and the only commodities of importance that are lower are copper, oil and rubber. The decline in rubber is apparently due to a break in the Eastern plantation prices. The decline in oil, as the President points out, is attributable to the California production, and the best judges are coming to the conclusion that the persistent weakness of copper reflects the ability of the big companies to produce cheaply rather than to any contraction in the demand, which is suprisingly good. A well known trade authority points out that the inevitable result will be the elimination of the smaller producers and the practical control of the market by the large interests who own the more important mines in this country and South America.

Raw wool is firm and higher, both here and abroad, and no little surprise is expressed at the unusual export demand for American wool. The exports for the week ended Oct. 6 were over 1,000,000 pounds. The quantity is not large, but the fact that Europe is buying wool here is construed to indicate that the purchasing power of Europe is greater than was generally supposed. A similar conclusion is drawn from a report issued by the Department of Commerce which shows that during the eight months ended Aug. 31 our exports to Germany included 509,000 bales of cotton and 108,000,000 pounds of copper.

It is, however, a mistake to assume that all this cotton and copper were for consumption in Germany. Much of it represents transit goods shipped via Hamburg and Bremen for ultimate consumption in Czechoslovakia, Poland, Switzerland and even Russia. It is, however, evident that the condition of private business in Europe, Great Britain alone excepted, is better than most Americans have been led to believe, and as inflation seems to be bringing a certain sort of prosperity to most of the continental nations it is not surprising to read that a considerable party in Great Britain is now urging the government to resort to a policy of inflation there by way of relieving the depression and unemployment.

It is unlikely that any such policy will be adopted as long as the Conservatives are in power, but it is quite possible that a continuance of the present depression in British trade may force a resort to it. If this occurs America may be called upon to consider what will happen to trade on this side of the Atlantic if all the monetary gold in the world is sent here.

The weekly statement of the Federal Reserve System shows an increase of nearly $7,000,000 in the gold held and a memorandum issued by the Federal Reserve Board during the week points out that the gold in circulation has increased by $228,000,000 during the 12 months ended Sept. 30. The result is that the loan expansion now in progress has failed to work any reduction in the reserve ratio, which still stands at 76.1, and the ultimate effect may be a condition of gold inflation on this side of the Atlantic which political considerations would make it difficult to arrest before the Presidential elections of next year are held.

This possibility, though remote, is one that should not be lost sight of, and if it becomes an actuality then the lethargic stock market, which is now neglected, could hardly fail to reflect such a compelling influence in favor of higher prices.

The investment demand for bonds and high-class securities not actively traded in on the exchange is already improving and there are many who believe that the better tone apparent must soon find expression in a revival of speculation in the general list.

Plans for Meeting of Gear Manufacturers

The American Gear Manufacturers' Association will hold its seventh semi-annual meeting at the Mountain House, Lake Mohonk, N. Y., Oct. 25, 26 and 27.

A meeting of the executive committee is called for 10:30 on the morning of Oct. 25, but the first general session of the meeting will be at 1:45 p.m. when the new president of the Association, George L. Markland, Jr., of the Philadelphia Gear Works, will preside at the meeting.

Major Buckingham Will Speak

The routine business of the association, consisting of committee reports, election of new members, and other items of importance will occupy a good portion of the afternoon, followed by an address on "Analysis of Milled Gears" by Major Earl Buckingham, of the Niles-Bement-Pond Co., New York City.

No formal meeting of the association will be held on the evening of the opening day, this time being reserved for committee meetings.

The second general session will convene at 9:30 Friday, Oct. 26. In addition to reports from important committees, an address will be given by John Kottcamp, on "Training of Shop Executives."

At 12:00 noon, A. W. Copeland, of the Detroit Gear & Machine Co., will preside over a special meeting of the automotive group for the discussion of conditions in that industry.

The regular informal dinner of the association has been planned as a surprise and while no speaker has been announced, assurance is given that this event will equal if not surpass previous efforts. This dinner is scheduled for 6:30 p.m. Friday evening.

Evening Session

At 8:30 p.m. Friday the third general session will convene for an address by R. M. Hudson, Division of Simplified Practice, Chamber of Commerce of the United States, which will be followed by important committee reports.

The fourth and last general session of the meeting will be held at 9:30 Saturday morning, the principal address being on "New Applications for Gears," by E. W. Miller, of the Fellows Gear Shaper Co. of Springfield, Vt.

At noon George L. Markland, Jr., president of the association, and chairman of the industrial group, will discuss conditions of the industry with members of that group.

No program has been announced for Saturday afternoon, this time being at the disposal of the members for visitation, sight-seeing and play.

Many members of the association have signified their intention of bringing their wives and other members of their families to Lake Mohonk for this meeting.

Many Exhibitors at Power Show

The number, diversity and interest of the exhibits of the second exposition of Power and Mechanical Engineering promise to far excel those of the first exposition held in December, 1922. The 1923 exposition is to be held in the Grand Central Palace, New York City, from Monday, Dec. 3, through Saturday, Dec. 8.

The exhibits will be supplemented by an extensive program of moving picture films to be presented in co-operation with manufacturers. Last year the picture program was found to interest the layman who was not informed about technical processes and the engineer whose close application to one field of his work had not enabled him to keep up with progress in the rest of the profession.

About two hundred exhibitors have signed contracts for space at the exposition. The devices and apparatus to be exhibited cover the field of power and mechanical engineering from the handling of the coal at the power plant until power is turned into work in the factory.

Trade Catalogs

Grinding Machines. The Cincinnati Grinder Co., Cincinnati, Ohio. Cincinnati Universal grinding machines are minutely described and illustrated in this booklet which also contains blue print reproductions and interesting data on these machines.

Insulation. The Mitchell-Rand Manufacturing Co., 18 Vesey St., New York City. A well bound book of 160 pages entitled "Everything in Insulation" has been recently issued by this concern. It contains various styles of insulation for various jobs, has many tables of specifications and is altogether a valuable handbook for the shop.

Chain Hoists. The Motorbloc Corp., Summerdale, Philadelphia, Pa. Motor-driven chain hoists as used in the automobile repair shop, the body building factories, for use in lifting rolls of heavy paper, in machine shops, foundries and other places where the lifting of heavy materials is required are advocated in this folder. Details of design and construction as well as specifications are contained in the folder.

Welding and Cutting Apparatus. The Bastian-Blessing Co., 125-131 West Austin Ave., Chicago, Ill. The Rego line of cutting and welding tools as well as regulators, gages, cylinder manifolds, acetylene generators and accessories, are shown in this catalog.

Annular Ball Bearings. The Schatz Manufacturing Co., Poughkeepsie, N. Y. Diagrams of bearings and rollers, tables of r.p.m., various specifications and the uses of ball bearings are contained in this booklet. It is catalog No. 8 and the concern's product is trade named "Commercial."

Tool Holders. The Armstrong Bros. Tool Co., 317-357 North Francisco Ave., Chicago, Ill. A handy little booklet described as catalog B-23 containing descriptions, illustrations and specifications for all of the large line of tools made by this company has been issued.

Electric Furnaces with Internal Heaters. Automatic and Electric Furnaces, Ltd., 173-175 Farrington Road, London, E.C.1. This folder tells of the superiority of electric furnaces for industrial heat treatments.

Pulverized Fuel Systems. The Combustion Engineering Corp., Broad St., New York City. This is catalog L-1 in which is described the theory and the mechanical features of the powdered coal system. It is printed on dull coated stock in duo-tone ink and contains many illustrations.

Chucks. The Cushman Chuck Co., Hartford, Conn. Different types of chucks for various types of work are illustrated and described in a new booklet issued by this company.

Controller Valves. The Bristol Co., Waterbury, Conn. This is Bulletin No. 319, containing descriptions and illustrations of Bristol-Fuller controller valves for different uses.

Electric Hoists. The Detroit Hoist & Machine Co., Detroit, Mich. The large number of uses of electric hoists are detailed in this booklet and there are many illustrations both of parts of the machine and of the assembled machine in use.

Drill Sharpeners. The Sullivan Machinery Co., Chicago, Ill. This is bulletin No. 72-H issued in August by this company in which is described the processes of the machines made and the many advantages of using them.

Locomotive Hoists. The Whiting Corp., Harvey, Ill. Hoists for lifting locomotives and railroad cars are shown and described in a six-page folder that has been issued by this corporation.

Flexible Couplings. The Falk Corp., Milwaukee, Wis. The advantages of these Falk-Bibby flexible couplings together with diagrams and charts of specifications are to be found in the recent folder issued by this corporation.

Die-Castings. The Doehler Die-Casting Co., Brooklyn, N. Y. Data sheets, illustrations of the various uses of die casting, and a history of the process are to be found in this booklet.

Polyphase Induction Motors. The Burke Electric Co., Erie, Pa. This is bulletin 128 profusely illustrated and the details of construction told in the text.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Turbine, 110 volts, with complete switchboard, and also rheostat. Basse-Terre, Guadeloupe. Purchase. Reference No. 7917.

Machine for the manufacture of buckets from iron sheets by pressing, and the necessary driving unit. Benoni, Transvaal. Purchase. Reference No. 7921.

Power concrete mixers. Auckland, New Zealand. Agency. Reference No. 7936.

Builders' hoists or cranes. Auckland. Agency. Reference No. 7936.

General engineering supply lines. Durban, South Africa. Agency. Reference No. 7920.

Railway-workshop machinery. Adelaide, Australia. Purchase. Reference No. 7887.

Machine for manufacturing wire products. Bilbao, Spain. Purchase. Reference No. 7932.

Scientific apparatus for engineers, architects and others. Lille, France. Purchase and agency. Reference No. 7896.

Forthcoming Meetings

American Welding Society. Fall meeting. Oct. 24, 25 and 26. Fort Pitt Hotel, Pittsburgh, Pa.

Society of Automotive Engineers. Production meeting at Cleveland, Ohio, Oct. 25 and 26. Headquarters, 29 West 39th St., New York City.

American Gear Manufacturers Association. Fall meeting. Mountain House, Lake Mohonk, N. Y. Oct. 25, 26 and 27. T. W. Owen, secretary, 2,443 Prospect Ave., Cleveland, Ohio.

American Management Association. October 29, 30, and 31, Hotel Astor, New York City.

American Society of Mechanical Engineers. Annual meeting, Dec. 3 to 6, in New York City. Calvin W. Rice, 29 W. 39th St., New York City, secretary.

National Exposition of Power and Mechanical Engineering. Second annual exposition to be held at the Grand Central Palace, New York City, Dec. 3 to 8. Headquarters, Grand Central Palace, New York City.

Society of Automotive Engineers. Annual meeting, Jan. 22 to 25, at the General Motors Building, Detroit, Mich. Coker F. Clarkson, 29 W. 39th St., secretary.

Foreign Trade Council. Eleventh annual convention at Boston, June 4, 5 and 6. O. K. Davis, India House, Hanover Square, New York City, secretary.

New and Enlarged Shops

Machine Tools Wanted

Ark., Brinkley—Dykes & Kelt—drill press and lathe for garage.

Fla., Ocala—E. Tucker—lathe and drill press for automobile repair shop.

Fla., Tampa—R. Moore, 412 East Michigan Ave.—bench tools, also pipe threading and cutting machine.

Ill., Chicago — Chicago, Burlington & Quincy R.R., 547 West Jackson Blvd., L. N. Hopkins, Purch. Agt.—one motor driven grinding machine.

Kan., Lawrence—Knowles Bicycle Shop, E. Knowles, Purch. Agt.—8 in. lathe.

Kan., Lawrence—C. W. Smith Motor Co. —8 in. lathe.

Mass., Boston—Boston Gear Wks., 256 Franklin St., address the purchasing agent —machine tools, etc., for proposed addition to plant.

Mass., East Walpole—Bird & Son Co.— equipment for proposed machine shop.

Mass., New Bedford—New Bedford Welding & Machine Co., 1 Rodman St.—machine shop equipment.

Mass., Worcester—Hyde Machine Co., 13 Hope Ave., address manager—equipment for proposed machine shop.

Mo., Cape Girardeau — F. A. Groves — lathe and drill press for automobile repair work.

Mo., Henley—O. S. Reaves—lathe for garage (used).

Mo., Kansas City—H. B. Vining, 1405 Waldheim St.—two drill presses, etc., for repair shop.

Mo., Russellville—Eberhardt's Garage, A. V. Eberhart, Purch. Agt.—drill press.

Mo., St. Louis—Miltons-Elkins Co., 2622 South 3rd St. (woodwork)—lathe, 20 in., short bed.

N. Y., Buffalo—S. Memel, 349 William St.—equipment for garage and repair shop at 35 Randall St.

N. Y., Buffalo—M. Williams, 405 Amherst St.—equipment for automobile and wagon repair shop.

N. Y., Mount Morris—Mount Morris Garage, State St.—small tools and equipment for garage and service station.

N. Y., New York—Pollack Conduit Co., 467 Greenwich St., A. Kipnis, Purch. Agt.— one No. 18 and two No. 19 Bliss presses.

O., Columbus—Shaffer Roofing Co., 272 West Broad St., W. A. Shaffer, Mgr.—metal working machinery for proposed $40,000 factory.

O., Kent—Doe Electric Device Co., 403 South Water St., W. S. Doe, Mgr.—machine tools, including two lathes, three drill presses and two grinders.

O., Youngstown—Republic Iron & Steel Co., Republic Bldg.—blacksmith shop equipment, also special machine shop machinery and equipment, to replace that which was destroyed by fire.

Okla., Cardin—Cardin Motor Co.—drill press and air tank for air compressor outfit.

Okla., Cardin—Tar River Mchy. Co.— large lathe.

Pa., Pittsburgh—Fawcus Machine Co., 2818 Smallman St.—one 24 in. internal grinder and one 24 in. automatic bevel gear.

Pa., Pittsburgh—Pittsburgh & Lake Erie R.R., Pittsburgh & Lake Erie Terminal Bldg., C. M. Yohe, Purch. Agt.—600 ton wheel press and 24 in. shaper.

Pa., Waynesboro—Frick Co. (manufacturer of ice machinery)—one 12 in. and one 60 in. throat punch.

Tex., Forth Worth—P. Garrett Motor Co., 13th and Burnett Sts.—lathe and drill press.

Tex., Rockdale—W. E. Gaither—lathe, drill press and burning in machine.

Va., Portsmouth—Southern Brake Shoe Wks.—drill press.

Va., Richmond—J. E. Stone, 608 East Clay St.—drill press for automobile repair work.

W. Va., Huntington—Hupmobile Garage —drill press and lathe.

Wis., Milwaukee—Stewart-Warner Products Service Sta., 582 Jefferson St.—automobile repair shop equipment, grinder, drill press, etc., for proposed $100,000 service station.

Ont., Bonnechere—Harturg & McIntyre— repair machinery, compressor, etc., for garage.

Ont., Moose Creek—C. Julliau—equipment for garage and repair shop.

Ont., Oshawa—Oshawa Ry., H. W. Cooper, Gananoque, Mgr. and Purch. Agt.— equipment for proposed car barn and repair shop, here.

Ont., Renfrew—McGarvey & Demarce, R. McGarvey, Purch. Agt.—automobile repair equipment, gasoline tanks and pumps.

Que., Lachute—T. McQuat & Son—hammers and shop equipment for foundry.

Que., St. Telesphore—O. Bourgon—lathe, etc., for blacksmith shop.

Que., Shawville—J. P. Wilson—automobile repair machinery.

Machinery Wanted

Ala., York—Rumley Planing Mill—circular saw, planer and mortising machine.

Calif., Los Angeles—Gonzales Townsite Co., Bank of Italy Bldg.—newspaper press, linotype, newspaper folder, belting, hangers and pulleys.

Calif., Millbrae — West Coast Porcelain Co., R. L. Dunn, 815 Battery St., San Francisco, Secy.—machinery and equipment for proposed $1,000,000 plant.

Conn., Hartford—Belemose Corp., Rocky Hill Section (manufacturer of artificial silk)—special machinery, looms and equipment for new plant.

D. C., Wash.—J. L. Kolb, 923 New York Ave., N. W.—equipment for steam laundry.

D. C., Wash.—Purchasing Clerk, Bureau of Engraving & Printing—receiving bids until Oct. 25 for four transfer presses and two automatic feeders.

Fla., West Palm Beach — H. Sharp— newspaper press, linotype and other equipment.

Ill., Chicago—Illinois Central R.R. Co., 135 East 11th Pl., J. J. Bennett, Purch. Agt.—one 300 lb. helve type power hammer.

Ill., Sparta—P. W. Randolph, Box 216— job printing press.

Ind., Jeffersonville—Quartermaster, United States Army—electric spot welding machine and rotating type sand blast barrel.

Ind., Marion—Elam Paper Co.—paper making machinery and equipment for proposed plant.

Ind., Sullivan—P. Poynter (newspaper) —intertype machine.

Kan., Lawrence—Hamilton Motor Co., J. Hamilton, Purch. Agt.—valve grinding machine.

Kan., Lawrence—Modern Shoe Shop, R. A. Beck, Purch. Agt.—power splitting gage.

Kan., Wichita—Missouri Central Type Fdry., 705 East Murdock St.—two diamond presses.

Ky., Louisville—Office of United States Engineer, P. O. Box 72—one pneumatic drift bolt driver for bolts up to 1¼ in. diameter and 10 ft. long.

Ky., Pikeville—Cumberland Publishing Co.—pony cylinder press.

Ky., Tompkinsville—Palmore & Emmert —sawmill and planer knives, etc.

Me., Belfast—Bd. Educ.—machinery for manual training department of high school.

Mass., Boston—Jennison Extract Co., 2 Central Wharf—sifting, grinding and mixing machinery.

Mass., Boston—J. J. Smith, 15 School St.—concrete block machine and mixer (used).

Mass., Cambridge—Lally Column Co., Erie St. (iron and steel products)—gate shear to handle material up to 1¼ x 16 in. (used).

Mass., Canton—Massachusetts Hospital School—complete laundry machinery and equipment.

Mass., Franklin — Bd. Educ. — manual training equipment, including lathes, planer, matchers, mortisers, saws, tables, small tools, pulleys, belting and shafting, for new high school.

Mass., Northampton—Bd. Educ.—manual training equipment, including, lathe, planer, matcher, saws, tables, belting, pulleys and shafting, for new grammar school.

Mass., Oxford—Bernon Mill, address the manager—several looms for woolen mill.

Mass., Palmer—Palmer Journal Co.— folder for circular work.

Mass., Shirley—Shirley Mills, address the manager—four or five wool pickers.

Mass., Stoneham (Boston P. O.)—School Com.—machinery for manual training department of proposed $275,000 high school.

Mass., Woburn—Tribble Cordage Co., Union St.—machinery for the manufacture of rope, to replace that which was destroyed by fire.

Mass., Worcester — Rice-Barton-Fales Co., Taintor St.—machine for bending brass, copper and aluminum sheets.

Mich., Detroit — J. F. Lamb Co., 1938 Franklin St.—two crank shapers (used).

Mich., Detroit—Michigan Stamping Co., 11631 Mack Ave.—miscellaneous equipment for proposed $75,000 addition to factory for making metal stampings.

Mo., Caruthersville—J. R. Hutchinson— complete equipment for excelsior mill.

Mo., Fair Play—E. C. Hadley & Son— newspaper press and job press.

Mo., Jefferson City—Daily Post—paper cutter.

Mo., Joplin—E. E. Skelton, 108 Main St. (cabinet maker)—bandsaw.

Mo., Joplin—Walker's Gospel Messenger, 926 Main St., C. C. Walker, Purch. Agt.— linotype, Miller feeder and printing press.

Mo., Kansas City — M. A. Nevins, 1250 Tracy Ave.—combination woodworker.

Mo., Russellville — Central Missouri Leader, R. H. Parks, Purch. Agt.—8 x 12 in. job printing press.

Mo., St. Louis—B. Field, P. O. Box 1469 buffing machine and leather cutting wheel.

Mo., St. Louis—Schmidt Bros., 4371 Laclede Ave. (automobile repairs, etc.)— welding and cutting outfit.

Mo., St. Louis — F. E. Vrooman, 1122 Hickory St.—two tanks and pumps, air outfit, etc., for oil filling station.

N. H., Newmarket—School Com.—manual training equipment for new high school.

N. M., Portales—L. J. Whiteman—job printing press.

N. Y., Bergen—G. R. Erlwin, Lake St.— ovens and equipment for bakery, to replace that which was destroyed by fire.

N. Y., Bliss—Bliss Printing Plate Co., Inc., L. F. Uttley, Purch. Agt.—machinery and equipment for printing, engraving and lithographing plant.

N. Y., Buffalo—C. & C. Candy Co., 331 14th St.—candy making equipment.

N. Y., Buffalo—J. O. Guercio, 312 Front Ave.—equipment for macaroni factory.

N. Y., Geneva—W. L. Packard, Border City—linotype, perfecting, 2 revolution and job printing presses.

N. Y., Horseheads—Dairymen's League, address manager — equipment, including shafting, hangers, pulleys, milk cooling machines, evaporators, etc., for proposed station.

N. Y., Jewettville—Jewettville Clay Products Co.—machinery and equipment for the manufacture of brick and clay products, to replace that which was destroyed by fire.

N. Y., Niagara Falls—Union Carbide Co., Union St.—special machinery and equipment for addition to plant.

N. Y., Niagara Falls — Wicker Lumber Co., Main and Lockport Sts., G. M. Wicker, Purch. Agt.—lumber mill and dry kiln machinery and equipment.

N. Y., Whitehall—Whitehall Times—7 or 8 column flat bed press.

N. C., Reidsville—F. P. Turner—machinery for the manufacture of name and automobile plates.

O., Ashtabula—Star-Beacon (newspaper) —stereotype saw for electric motor attachment.

O., Columbiana—Columbia Tire & Rubber Co., P. Schultz, Mgr.—machinery and equipment, including shafting, hangers, belting, etc., for plant at Mansfield.

O., Columbus — Columbus Woodworking Co., 2034 Leonard Ave., W. A. Slatter, Pres. —machinery to enlarge plant.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Iron and Steel—Pig-iron sales dropped to half of usual volume. Consumers purchasing on basis of month to month requirements. Japan will need about 60,000 tons of galvanized steel sheets; Japanese buying on strictly competitive basis, hence, several large steel orders placed in Germany. Steel plates firm at $2.50 per 100 lb., Pittsburgh, with reports of shading to $2.40 in certain instances. Structural market quiet but with no evidence of weakness; quotations holding firmly at $2.50. Bars firm at $2.40 base. Rest of steel list firm with exception of shading in black sheets and decline in iron and steel scrap.

Declines—Copper at lowest price reached in more than a year; dropped ⅜c. per lb. in week. Tin down 1¼c. per lb. in New York; antimony, ½c., since last week. Copper sheets declined ½c. per lb. in Cleveland; old metals (non-ferrous) also lower. Drop of about 25c. per ton on furnace coke at Connellsville.

No advances reported.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$26.05
Northern Basic	25.00
Southern Ohio No. 2	25.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	29.00
BIRMINGHAM	
No. 2 Foundry	23.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	25.25
Virginia No. 2	29.17
Basic	25.00
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	25.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	28.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	26.77
Basic	26.77
Bessemer	27.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.75
Cleveland	6.75@7.40
Cincinnati	7.50
New York	5.50@7.00
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.15
No. 12	3.10	4.64	3.80	4.20
No. 14	3.20	4.69	3.85	4.25
No. 16	3.40	4.79	3.95	4.35
Black				
Nos. 17 and 21	3.70	4.95	4.45	5.05
Nos. 22 and 24	3.75	5.00	4.50	5.05
Nos. 25 and 26	3.80	5.05	4.55	5.10
No. 28	3.85	5.15	4.65	5.20
Galvanized	**Pittsburgh**	**New York**	**Cleveland**	**Chicago**
Nos. 10 and 11	4.00	5.15	4.70	5.35
Nos. 12 and 14	4.10	5.25	4.80	5.45
Nos. 17 and 21	4.40	5.55	5.10	5.75
Nos. 22 and 24	4.55	5.70	5.25	5.90
No. 26	4.70	5.85	5.50	6.05
No. 28	5.00	6.15	5.80	6.35

WROUGHT PIPE (Welded)—The following mill discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	62	50½	¼ to 1¼	30	13
		LAP WELD			
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	28	13
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	60	49½	¼	28	12
2 and 3	61	50½	1 to 1½	30	14
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ¼-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
¼	$0.09	50%	⅞	$0.16	35%
½	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold drawn shafting or screw	4.65	3.90	4.55
Cold drawn flats, squares	5.15	4.40	5.05
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.25 at mill)	3.54	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			13.37½
Tin, 5-ton lots, New York			42.00
Lead (up to carlots), St. Louis	6.60	New York	7.37½
Zinc (up to carlots), St. Louis	6.20	New York	6.70

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.50	27.00	25.50
Antimony (Chinese), ton spot	8.50	10.50	.....
Copper sheets, base	21.25	21.50	23.00
Copper wire, base	15.50	18.75	16.25
Copper bars, base	19.75	22.00	19.50
Copper tubing, base	24.00	27.00	23.00
Brass sheets, base	17.50	21.75	18.75
Brass tubing, base	22.50	27.00	20.50
Brass rods, base	*15.25	17.75	15.75
Brass wire, base	18.00	21.75	.....
Zinc sheets (casks)	10.25	10.45	.....
Solder (½ and ½), (case lots)	29.50	29.00	.....
Babbitt metal (83% tin)	52.00	53.50	.....
Babbitt metal (35% tin)	25.00	17.50	.....
Nickel (ingot and shot)	29.00	.....	.....
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00
Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.75	11.50	12.00
Copper, heavy, and wire	10.75	11.00	11.25
Copper, light, and bottoms	9.50	9.00	10.25
Lead, heavy	5.75	5.25	5.75
Lead, tea	4.75	4.00	4.75
Brass, heavy, yellow	7.00	....	7.25
Brass, heavy, red	8.75	9.25	9.00
Brass, light	6.25	5.00	6.50
No. 1 yellow brass turnings	7.00	5.75	7.00
Zinc	3.75	2.75	4.00

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$25.10	$22.85	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.40	18.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	13.00	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13¼x13¼, per lb.	11.00	36.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.98	1.02	1.14
White lead, dry or in oil	100 lb. kegs.	New York,	14.00
Red lead, dry	100 lb. kegs.	New York,	14.00
Red lead, in oil	100 lb. kegs.	New York,	15.50
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$4.00@4.25	
Coke, prompt foundry, Connellsville	per net ton	5.00@5.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40-10%	50-10%	45-5%
1½ and 1¼x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	25-10%	$3.50 net	...
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30-10%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	40-10%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30-10%	45%	40-5%
Bolt ends, with hot pressed nuts	40-10%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, 5/16 and smaller	60%	.....	.....
Semi-finished nuts, ⅜ and larger	55%	65-10%	80%
Case-hardened nuts	40%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅝ in., per 100 lb. (net)	5.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	0.50	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	0.50	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	0.50	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	0.50	2.75	2.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	50-10%	50-10%	60%
Rivets, tinned	50-10%	50-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1½ to 1¾-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

	New York	Cleveland	Chicago
Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30-10%	30-10%	30-10%
Heavy grade	20-5-2½	30%	20-5-2½%
Rubber and duck:			
First grade	50-10-5%	50-10%	40-10%
Second grade	60-5%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.73	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20

O., St. Clairsville—Amer. Zinc Co.—machinery for proposed addition to sulphuric acid plant for the manufacture of paint and linoleum.

O., Sidney—Carothers Candy Co., W. R. Carothers, Purch. Agt.—machinery and equipment for new plant.

O., Wellston—Wellston Mfg. Co.—5 ton electric hoist, 220 volt, 60 cycle, 2 phase.

Okla., Cardin—Coyne Lumber Co.—wood lathe, Universal combination saw and belt sander.

Okla., Picher—G. W. Fuller—tire shrinker for blacksmith shop.

Okla., Tulsa—J. Bradford, 818 South Columbia St.—gasoline pump, tube pump and air compressor.

Pa., Pittsburgh—W. J. Early Sons Co., 812 Sarah St. (iron foundry), J. W. Early, Genl. Mgr.—two 15 ton cranes, 70 ft. span.

Pa., Pittsburgh — Seldon Chemical Co., McCartney and Independence Sts.—compressors and equipment to replace that which was destroyed by fire.

Pa., Wayne Junction (Phila. P. O.)—J. Dyson, Cope's Mill—forty or fifty Clipper revolving box looms.

R. I., Central Falls (Pawtucket P. O.)—Bd. Educ.—machinery for manual training department of proposed high school.

S. C., Chester—T. L. Eberhardt, R. F. D. 3—complete brick making machinery.

S. C., Gaffney—Globe Mfg. Co., address manager—about 200 looms for cotton mill.

S. C., Greenville—Hunt & McKnight—cylinder press, job press and paper cutter.

S. D., Ipswich—W. L. Johnson—job printing press.

Tenn., Nashville—Turner, Day & Woolworth Handle Co., Inc., 1404 Adams St.—equipment for proposed $100,000 factory, to replace that which was destroyed by fire.

Tex., Dallas—Egan Printing Co., 912-14 Ross Ave.—combination woodworking machine.

Tex., Dallas—First Texas Chemical Mfg. Co., 1814 North Lamar St., W. H. Madden, Purch. Agt.—job press and Miller feeder.

Tex., Dallas—The Printer, 130 West 9th St.—job printing press with electric motor.

Tex., Dallas—A. Steinhaus, 4702 Worth St.—newspaper and job presses.

Tex., Tyler—Tyler Printing Calendar Co.—wire stitcher and multiple punch.

Va., Ashland—Hanover Promoter—one linotype machine.

Va., Purcellville—Blue Ridge Herald—cylinder press, job press and paper cutter.

Va., Richmond—Hackley Morrison Co., 1708 Lewis St.—mounted gasoline air compressor, 150 ft. capacity; coal elevator for unloading cars.

Wash., Spokane—A. R. Gross, 807 Ash St.—newspaper press.

W. Va., Harrisville—Gazette— 7 column newspaper press.

Wis., Appleton—Fox River Tractor Co., Rankin St.—machinery for the manufacture of silo filling devices.

Wis., Barton—Bd. Educ., R. Kocher, Secy.—woodworking and manual training equipment for proposed high school.

Wis., Doylestown—Wuetrich Bros.—special machinery and equipment for proposed $40,000 factory for the manufacture of milk products at Astico.

Wis., Horicon—Davies Shoe Mfg. Co.—shoe making machinery, cutters, etc., for proposed $50,000 factory.

Wis., Kenosha—Kenosha Fruit Co., 452 Pearl St.—refrigeration machinery for proposed $50,000 warehouse.

Wis., La Crosse—Lehmann's Tire Service, 127 North 3rd St.—large tire press.

Wis., La Crosse—Mashak & Schwalbe, 326 South 5th St.—air compressor, emery wheel, stand, gasoline storage tank and pump for proposed $45,000 garage.

Wis., La Crosse—L. McCarty, 6th and Cass Sts. (automobile repairs)—emery wheel, stand, electric drill and chain hoist.

Wis., Ladysmith—W. E. Thompson (sawmill)—large band saw, re-saw, belting and shafting.

Wis., Merrill—Gerke Concrete Block Co.—miscellaneous machinery and equipment for the manufacture of blocks.

Wis., Milwaukee—Koehring Co., 31st St. and Concordia Ave.—electric crane.

Wis., Milwaukee — W. C. Maronn, 724 Muskego Ave.—candy making machinery, including dippers, beaters, mixers and coating machines, all equipped with individual motors.

Wis., Milwaukee—Milwaukee Electric Ry. & Light Co., Public Service Bldg.—chain hoist for proposed garage.

Wis., Milwaukee — Milwaukee Woodwork Mfg. Co., 3320 Fond du Lac Ave., F. Groose, Purch. Agt.—matcher and planer.

Wis., Milwaukee—Raab Motor Co., 3701 Lisbon Ave., F. Raab, Purch. Agt.—one 2 ton hoisting crane for garage.

Wis., Milwaukee—Schmitt-Orlow Co., 256 South Water St.—20 to 30 in. bandsaw.

Wis., Milwaukee—Thorner Heat Treating Co., 126 Ferry St.— special furnaces for proposed $40,000 plant.

Wis., Milwaukee—H. Weisner, 1433 Prairie St.—air compressor, gasoline storage tank and pumps for proposed $40,000 garage.

Wis., Plymouth—Plymouth Phonograph Co.—glueing machinery and dovetailers for proposed $45,000 factory.

Wis., Spring Green—Spring Green Canning Co., c/o W. P. McDonnell—canning machinery, sealers, testers, etc., for proposed $50,000 factory.

Wis., Stanley—Stanley Baggage Co., P. A. Fein, Pres.—machinery for the manufacture of leather bags, suit cases, etc.; also metal working, stamping machinery, etc.

Wis., Wauwatosa — Economy Block Co., 7th and East North Aves. (manufacturer of concrete building blocks), A. Schwalke, Purch. Agt.—tamping machine, electrically driven.

Ont., Alexandria—R. MacDonald—portable drilling machine, etc., for garage.

Ont., Alexandria—A. Marleau—chain hoist, bench tools, etc., for garage.

Ont., Cobden — A. F. Buttle — emery grinder, small tools, etc., for garage.

Ont., Green Valley — J. Emburg — tire shrinker, etc., for blacksmith shop.

Ont., London—Carling Export Brewing Co., Talbot St., H. Low, Mgr.—equipment for the manufacture of soda water, ginger ale and soft drinks.

Ont., Niagara Falls—Christie Co., Murray St.—special machinery, shafting, hangers, pulleys, etc., for new $60,000 plant.

Ont., Ottawa—Calders Canada, Ltd., A. McDougall, Purch. Agt.—complete equipment for tie creosoting plants at Cochrane and Quebec.

Ont., Ottawa—Dept. of Public Wks., R. C. Desrochers, Secy.—equipment for ore dressing laboratory.

Ont., Peterboro—Canadian Watercraft, Ltd., J. E. Grivell, Purch. Agt.—complete equipment for building boats, scows, barges, etc.

Ont., Toronto—Canadian Packing Co., 3 Bathurst St.—cold storage equipment, etc., for proposed $1,000,000 meat packing house.

Ont., Yankleek Hill—Taylors Bros.—foundry equipment, presses, etc.

Que., L'Islet—N. Leclerc—circular saw, etc., for sash and door factory.

Que., Montreal—Mount Royal Metal Co., Ltd., J. E. Grivell, 3311 Lanorie St., Purch. Agt.—brass and iron foundry equipment.

Que., Montreal—A. Racine, 1990 St. Dominique St. (manufacturer of automobile bodies and carriages)—vulcanizing and welding equipment.

Que., Pont Rouge—Supreme Fdrys., Ltd.—squaring shear with open gap for 12 gage sheet; 63 in. folder for 20 gage; one slip form roller 60 in. for 24 gage.

Que., St. Jerome—T. Larose—saws, planers, etc., for sash and door factory.

Que., St. Malachie—L. Bissonnette—gasoline tank, pump and free air equipment for garage.

Que., Shawbridge—Foisy & Hotte—equipment for sash and door factory.

Sask., Swift Current—Van-Kel Cleansers, Ltd., J. A. Caulder, Moose Jaw, Purch. Agt.—machinery for the manufacture of artificial stone and articles made from Kisselguhr clay and tripolite.

Metal Working Shops

Conn., Hartford — The Hanson Whitney Mfg. Co., 169 Bartholomew Ave., awarded the contract for the construction of a 2 story, 50 x 80 ft. factory for the manufacture of machinery. Estimated cost $40,000.

Conn., South Manchester — H. Stephens awarded the contract for the construction of a 1 story (ultimately 3 story), 60 x 90 ft. garage on Center and Knox Sts. Estimated cost $40,000.

Conn., Stamford—H. H. Noack, Forest St., awarded the contract for the construction of a 2 story, 40 x 125 ft. garage on East Main St. Estimated cost $60,000.

Ill., Chicago—The Hudson Motor Co. of Illinois, 2220 South Michigan Ave., awarded the contract for the construction of a 1 story, 100 x 125 ft. garage on Ogden St. near Harding St. Estimated cost $50,000.

Ill., Chicago—The Madison Realty Co., 123 West Madison St., awarded the contract for the construction of a 1 story, 75 x 110 ft. automobile sales and service station at 2482-86 Milwaukee St. Estimated cost $100,000.

Ill., Chicago—H. P. Reger, 128 North La Salle St., is having plans prepared for the construction of a 1 story, 100 x 200 ft. garage at 1939-47 South Chicago Ave. Estimated cost $80,000. Hall, Lawrence, Rippel & Ratcliffe, 123 West Madison St., Archts.

Ind., Indianapolis — S. Bingham's Sons Co., 151 Kentucky Ave., manufacturer of printers' rollers, awarded the contract for the construction of a 2 story, 50 x 200 ft. factory on Alabama and Merrill Sts. Estimated cost $100,000.

La., Monroe—The Magnolia Carbon Co. is building a gasoline and carbon manufacturing plant, including machine shops, etc. Estimated cost $750,000. V. M. Davis, Ruston, Pres.

Mich., Detroit—The Columbia Motor Co., 6501 Mack Ave., is having plans prepared for the construction of a 1 story addition to its automobile factory on Charlevoix Ave. Estimated cost $100,000. Private plans.

Mich., Detroit—The Great Western Smelting & Refining Co., Russell St., awarded the contract for the construction of a 1 story, 193 x 208 ft. foundry and warehouse. Noted Sept. 27.

Mich., River Rouge (Detroit P. O.)—The Ford Motor Co., Highland Park, will soon award the contract for the construction of 1 story, 94 x 1,320 ft., 100 x 420 ft., 100 x 420 ft. and 100 x 620 ft. steel mill buildings, here. A. Kahn, 1000 Marquette Bldg., Detroit, Archt. Noted June 14.

Minn., St. Paul—The Ford Motor Co., Highland Park (Detroit P. O.), is having plans prepared for the construction of a 1 story, 606 x 1,726 ft. automobile assembly plant and factory, here. A. Kahn, 1000 Marquette Bldg., Detroit, and Stone & Webster Co., 147 Milk St., Boston, Mass., Archts.

N. J., Kearny—The Western Electric Co., 195 Bway, New York, will build a plant for the manufacture of telephone cables, here.

N. Y., Astoria (Long Island City P. O.)—The Polachek Bronze & Iron Co., 480 Hancock St., will soon award the contract for the construction of an addition to its plant. Estimated cost $120,000. J. M. Berlinger, 469 7th Ave., New York, Engr. and Archt.

N. Y., Brooklyn—The Sanlif Realty Co., c/o E. M. Adelsohn, Engr. and Archt., 1778 Pitkin Ave., will build a garage on Van Sinderen Ave. Estimated cost $50,000.

N. Y., Long Island City—The W. F. Kenny Co., 44 East 23rd St., New York, will build a 2 story, 75 x 200 ft. garage on Lawson St., here. Estimated cost $80,000.

N. Y., Rochester — The R. J. Strasenburgh Co., Exchange and Troup Sts., manufacturer of chemical and surgical instruments, plans to build a 4 story, 60 x 80 ft. addition to its plant. Estimated cost $50,000. Engineer or architect not announced.

O., Cleveland—The Miller-Becker Co., c/o I. Miller, 6411 Central Ave., awarded the contract for the construction of a 2 story, 50 x 135 ft. garage on Central Ave. and East 65th St. Estimated cost $60,000.

O., Cleveland—H. F. Neighbors, Bulkley Bldg., awarded the contract for the construction of a 1 story, 100 x 200 ft. garage at 1826 East 24th St. Estimated cost $50,000.

O., Cleveland — C. W. Schaefer, Society for Savings Bldg., awarded the contract for the construction of a 1 story, 62 x 103 ft. garage at 1410 West 55th Pl. Estimated cost $40,000.

O., Rocky River—The River Garage Co., 1183 Cook Ave., awarded the contract for the construction of a 1 story, 15 x 225 ft. garage on Blount St. Estimated cost $40,000.

Pa., Johnstown—The Penn Overland Co., 713 Railroad St., plans to build a 3 story, 85 x 120 ft. garage, service station and show room on Central Ave. Estimated cost $100,000. N. K. Gougeon, Mgr.

Pa., Parkview (Pittsburgh P. O.)—The Bd. of County Comrs., Court House, Pittsburgh, is having plans prepared for the construction of a 2 story, 70 x 330 ft. work shop, here. Estimated cost $200,000. Private plans.

Pa., Phila.—The Ford Motor Co., Highland Park (Detroit P. O.), will soon award the contract for the construction of a 1 story, 400 x 920 ft. automobile assembly plant on 63rd St., here. A. Kahn, 1000 Marquette Bldg., Detroit, Archt.

Wis., Elkhorn—G. A. Van Velzer, Williams Bay, plans to build a 2 story garage and repair shop on Wisconsin St., here. Estimated cost $40,000. Engineer or architect not selected.

Wis., Milwaukee — R. Plapinski, 614 Mitchell St., awarded the contract for the construction of a 1 story, 47 x 120 ft. garage on 8th Ave. Estimated cost $40,000.

Wis., Neillsville—O. Lerverenz will build a 50 x 60 ft. garage, repair shop and filling station. Estimated cost $40,000.